MACHINE AND TOOL ENGINEERING

The TOOL ENGINEER

AUGUST, 1943

Official Publication of American Society of Tool Engineers

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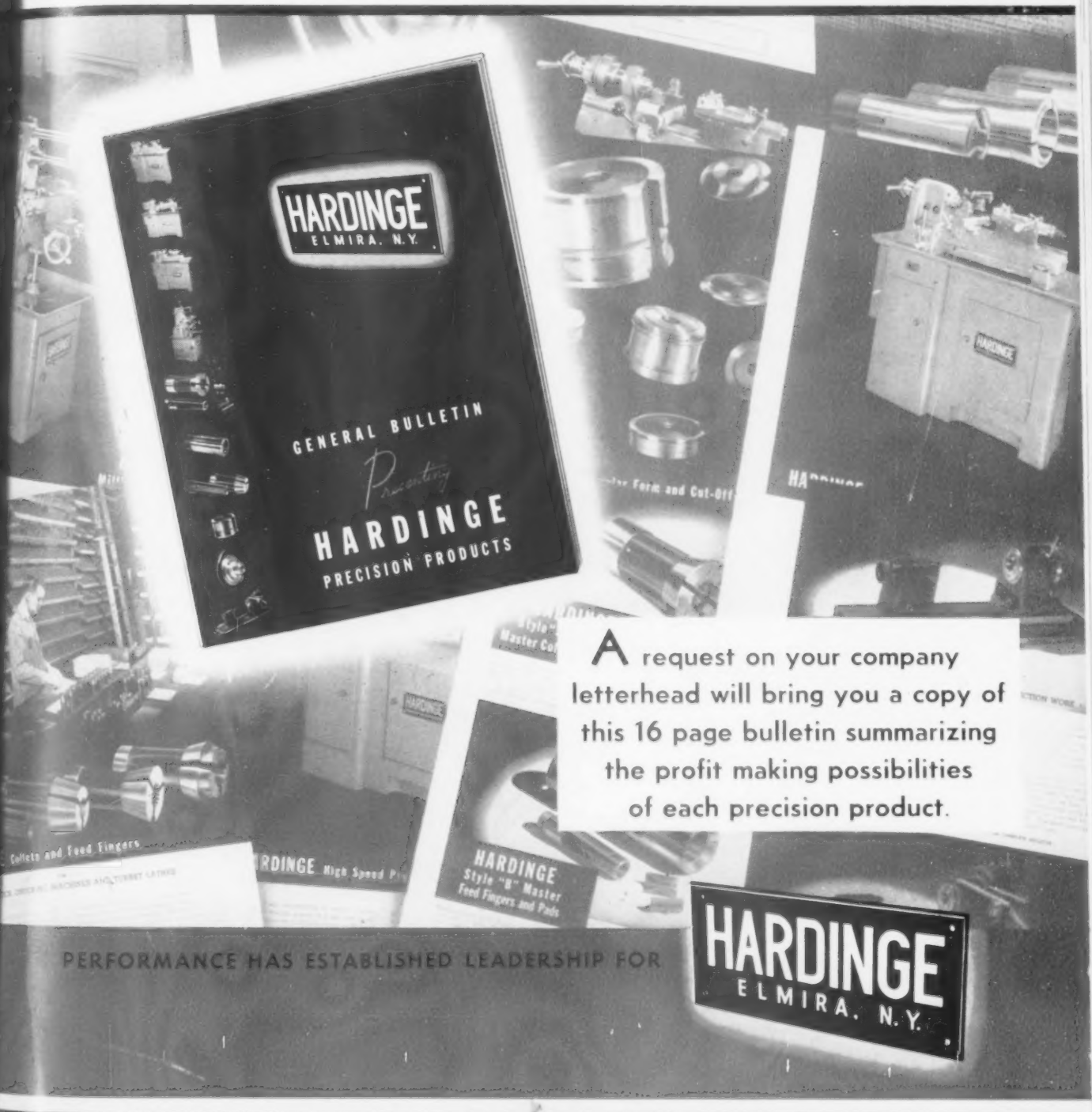

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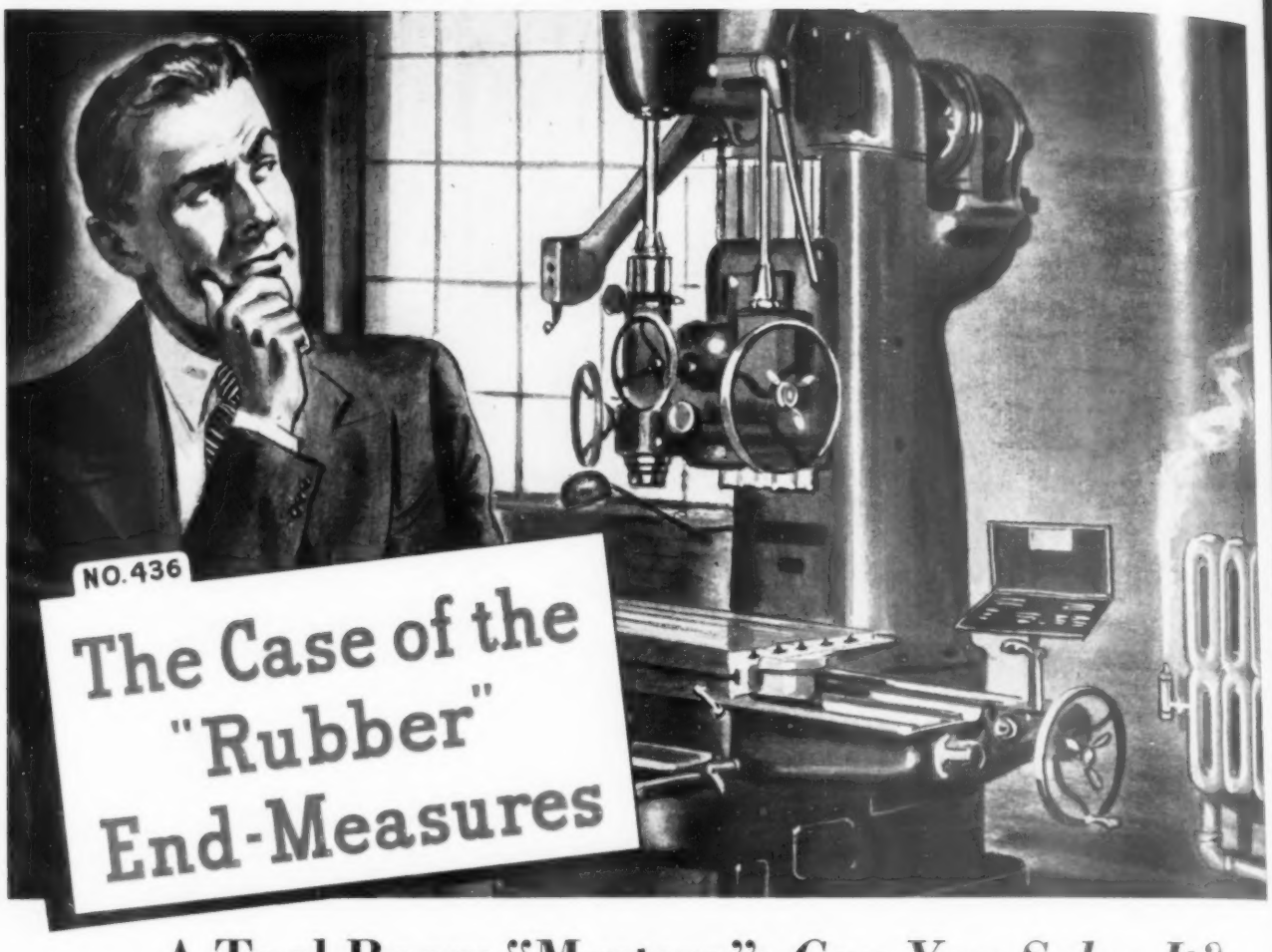
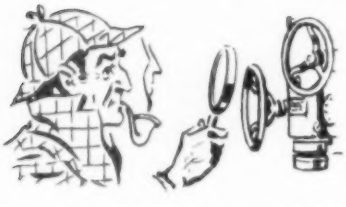


A Tool Room "Mystery": *Can You Solve It?*



The case: trouble in the tool room of a booming war production plant. Pratt & Whitney Jig Borers, perfect when they left our shipping room, had performed with all their usual amazing accuracy throughout the summer. But as fall came on, the operators began to complain of trouble with the end measures. Jobs were going haywire by as much as .002" . . . unheard-of in a P&W Jig Borer.

Clues: The P&W service engineer called in on the job was able to eliminate several common external causes of jig borer trouble. Many expanded plants these days are using warehouses or other old buildings where floor support is unsteady. Not so here. Others have placed the machines in direct sunlight, so that expansion and contraction ruined the set-up. Not so here. These new machines were positioned at a north wall, at windows where direct sunlight never entered. The operators worked in the comfortable warmth of steam radiators, far from the chilling draft at the windows. End measures were carefully stored within reach in their boxes over the radiators. *Problem:* spot the "Gremlin" behind this plant's sudden trouble.

Take 10 seconds to think it over

Answer: That's right! How could you miss? No sunlight, but thermal expansion and contraction still at work in two ways. Those cold drafts from the windows on one side of the machines and hot radiators on the other. Okay all summer, but when they turned on the heat — bang! Second, those end measures — stored above the radiators at some 30° above room temperature — contracted when they went into their channels on the machines, and so produced a shifting setting. Our service engineer pointed out these facts . . . assisted in redesigning the room so that the jig borers were on the inside wall and the benches on the opposite side. After that there was no further trouble.

* * *

Pratt & Whitney's skilled machine tool service engineers can help you spot and cure troubles in your shop layout. This one was pretty obvious, but chances are you have occasional headaches whose solutions don't leap to the eye. When you do, call on Pratt & Whitney. We don't just make good machine tools and let it go at that — we follow through to see that you get full value out of them. That's another way we can make good on our offer of *basic accuracy for mass production.*

PRATT & WHITNEY
Division Niles-Bement-Pond Company
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PRATT & WHITNEY

MACHINE TOOLS ★ SMALL TOOLS ★ GAGES

Basic Accuracy for Mass Production

Prompt Delivery? Yes!
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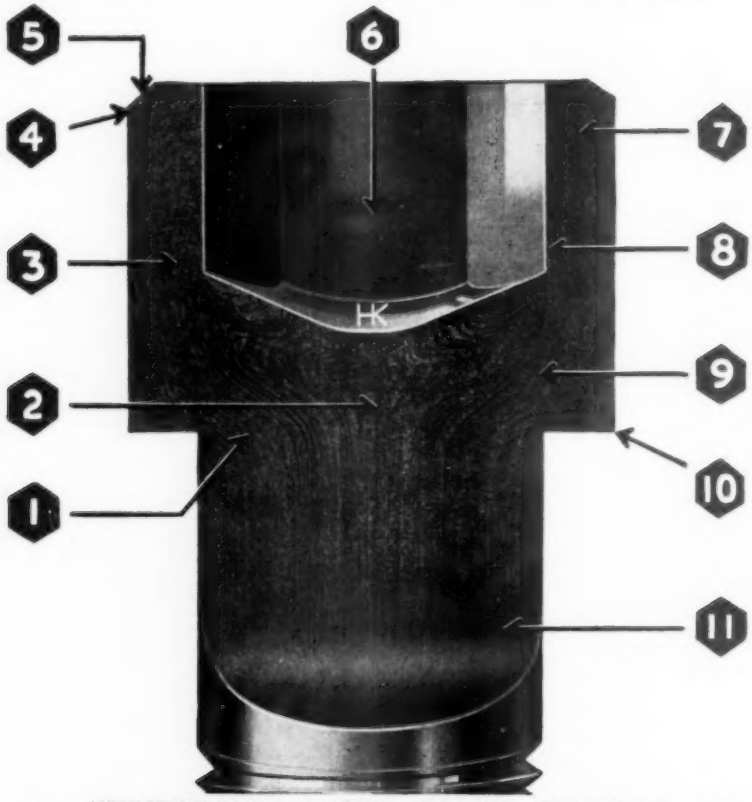
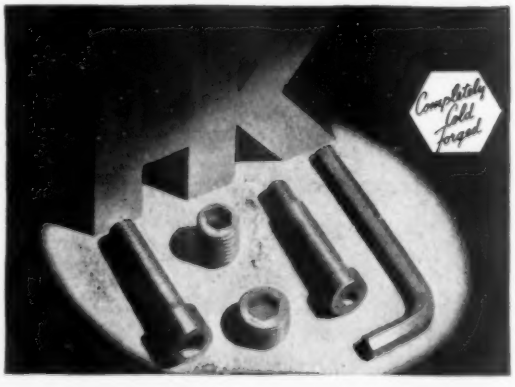


UNRETOUCHED PHOTO ETCHED CUTAWAY HOLO-KROME SOCKET HEAD CAP SCREW

THE 11 FEATURES

checked above show a few of the many "extra" qualities made possible by the patented Completely Cold Forging method—exclusively HOLO-KROME. Our Catalog explains in detail. Have you a copy?



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the results of a superior method patented, used solely by Holo-Krome in the manufacture of these precision made Completely Cold Forged Screws.

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The TOOL ENGINEER

VOL. XII T.M. REG. U.S. PAT. OFF. No. 8

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Publisher's Letter

I suppose that THE TOOL ENGINEER always will mean more to me than to anyone else, because after ten years on this job I know so well how it's put together each month. Perhaps I should say how it's "assembled", for every "story" must have a definite purpose in relation to the "job" we are doing—just as parts on an assembly line must mate, every nut and bolt fit, and every hole be accurately positioned so that the line moves smoothly and there are no production delays. Yet it's fun to keep "production" going, and to "come out" on time.

FACED with war-time censorship and engineers often too busy for interviews, we have our problems getting materials to do the job. There are no "N. E. Steels"—i.e. substitute articles—to replace the good material we have always tried to give you in this journal. Substitute or ersatz won't pass inspection—and we undergo more than 50,000 inspections per month by our readers.

Recently, we mentioned a man who stated he had seen hobbing machines run backwards. A belated inspection by one of our New York City readers finally threw that one back at us. That's one reject we can take in good grace, for there have been many cases since this frenzied war production started where this has happened. But, I won't prolong an argument. We mentioned it originally in the hope that it might do some good.

TWO of us are off tonight for points East—New York, Philadelphia, Bridgeport, Baltimore, Washington, Pittsburgh. We hope to bring back some worthwhile stories. Last time I was East I rode several hundred miles in an air-conditioned car—without air-conditioning. And that's bad. You see the windows were tightly fastened, they couldn't be opened, and railroad law prohibits passengers from standing on platforms. All I could do was to sit and "take it."

Stopping at the office on the way home from the railroad station Sunday morning, I found a letter from an old friend who runs one of the largest and newest Southern war plants.

He wrote: "I notice that THE TOOL ENGINEER is getting better and better . . . a magazine that is as good as any of the mechanical publications . . . I look forward every month to receiving it, and get a great deal of pleasure and education out of reading it."

Thanks, Jim. The entire TOOL ENGINEER staff appreciates such letters.

Roy T. Bramson

When Factories are Fortresses...

● Cutting tools are the weapons with which weapons are made. ● The craftsmen who build National cutting tools ask you to keep them fighting by keeping them working. Keep them working by keeping them sharp!

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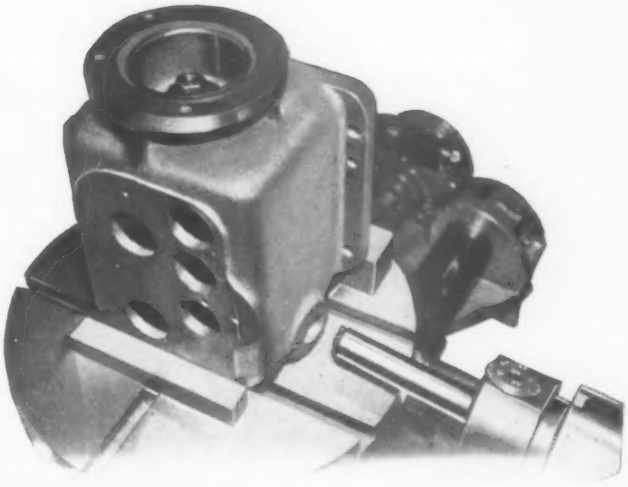
THIS JOB CAN BE BORED IN A *Single* SETUP

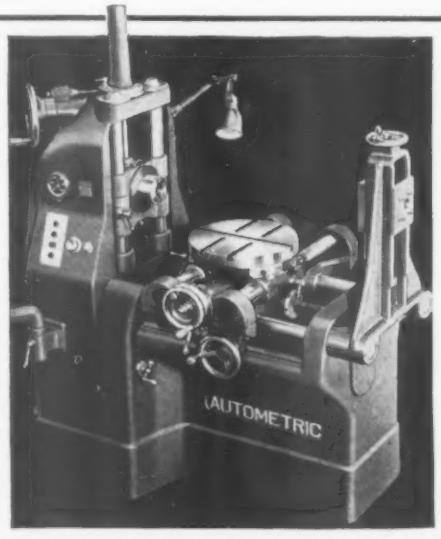
IT'S NO TRICK WITH THE AUTOMETRIC

MODEL B



This interesting boring job requires a minimum of setup time on the Autometric. Holes on all four sides of the gear case were accurately bored in relation to the large vertical bore — in one complete setup. Note that the hole is on a 15° angle.

The many-purpose Autometric Model 8 is designed for *today's* requirements — precision boring of a wide variety of mechanical parts. It handles a complete job in a single setup — faster and more accurately. Its simplicity makes training of operators easy.



Features of the AUTOMETRIC MODEL B

- Errorless measuring by the more rapid and more accurate AUTOMETRIC Method.
- Infinite variation of spindle speeds by finger-tip control.
- Infinite selection of feeds by finger-tip control.
- Steel Ways — hardened, ground, and super-finished.
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- Well-ribbed body casting for permanent alignment and rigidity.

Write for full details of the Model B Autometric Jig-Boring Machine

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•
Autometric Jig Borers
•
Center Scope

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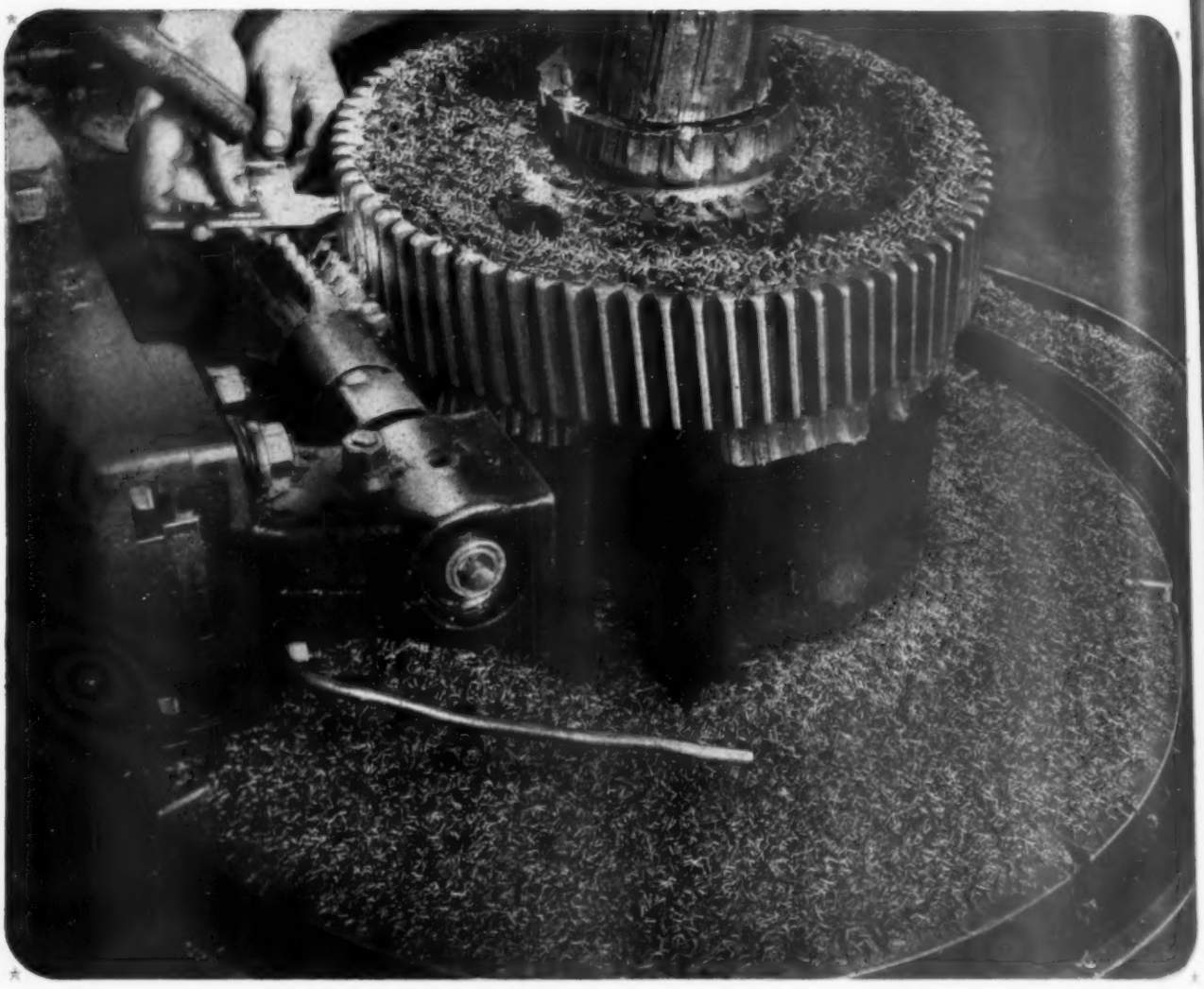

KEEP 'EM CUTTING . . AND SAVE THE PIECES

IN this war, machine tools on the average are cutting away steel at a rate more than 12 times faster than in 1918. That's production—keep them cutting!

Keep them cutting *faster* by selecting tool steels more closely suited to the job. Case after case in our files show increases in feeds, speeds, or pieces per grind—increases, often, of 50% and more—when the *right* tool steel went to work.

Keep them cutting *constantly* by knowing the best alternate tool steel for each job. Know it, and know its performance, as insurance against a time when your first-choice steel may be short in supply.

And save the pieces! Every particle of steel, especially High Speed Steel, is important, and much critical alloy material can be saved for re-use if proper methods of reclamation and classification are employed.

Let us help with your problems of selection, treatment, use and salvage.

ADDRESS DEPT. TE-4

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STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

A-8844 . . . W & D

Metals that can be Hard-Faced to make wearing parts last longer

Hard-facing is of particular importance today because when vital parts that are subjected to wear are hard-faced with rods made by Haynes Stellite Company, they last from 2 to 25 times longer. This helps to keep essential machines and equipment in service, and eliminates the needless scrapping of parts, excessive down time, and delays in production. Usually the amount of hard-facing material required is only a small percentage by weight or volume of the part to be protected.

Most of the commonly used metals can be hard-faced successfully. The following classification affords a means of determining what metals or alloys can or cannot be hard-faced, and by what method.* For more information, write for the booklet, "Hard-Facing With Haynes Stellite Products."

Carbon Steels (plain carbon steels up to 0.60 per cent carbon) — These can be hard-faced successfully either with the oxy-acetylene* or the metallic-arc process.

High-Carbon Steels (steels with carbon above 0.60 per cent)—Proper heat-treatment both before and after hard-facing by either process,* is advisable to prevent failure of the base metal because of its hardness and brittleness.

Low-Alloy Steels—These can be hard-faced in much the same manner as plain carbon steels, but in some cases heat-treatment is required after welding.

High-Speed Steel—The hard-facing of this group of steels is not recommended. They can be hard-faced without any trouble in so far as technique is concerned, but shrinkage cracks and strain checks frequently render the hard-faced piece valuless, regardless of heat-treatment.

Manganese Steel—Can be hard-faced successfully, using the metallic arc process.

Stainless Steels (18-8 chromium-nickel steels)—These steels can be readily hard-faced by either the oxy-acetylene process* or the metallic arc process. In some instances, heat-treating is required.

Straight-Chromium Steels (4-6 and 11-13 per cent chromium steels)—Can be hard-faced by either process.* To avoid cracking of the deposit, the part must be preheated almost to a red heat and cooled slowly, preferably in a furnace.

Cast-Iron—Cast Iron can be hard-faced by either process.* The procedure is different from that of steel because of the lower melting point of cast iron.

Chilled Iron—Small parts can be hard-faced with either the oxy-acetylene* or metallic arc process. On large parts difficulty is usually encountered.

Alloy Cast Iron—The procedure for hard-facing this material is the same as for ordinary gray cast iron.

Monel—Monel is easily hard-faced with the oxy-acetylene process.

Brass and Bronze—Because of their low melting points, these alloys cannot generally be hard-faced.

Copper — Because of its low melting point and high heat conductivity, it is best to use the metallic arc for hard-facing copper, preheating to a red heat.

Aluminum — Aluminum or its alloys cannot be hard-faced.

*For the majority of hard-facing applications, the oxy-acetylene process is generally used. The blowpipe allows close control over the operation and produces a smooth deposit. Particles of scale and foreign matter can easily be eliminated, and edges and corners can readily be formed. Other advantages include the elimination of rod loss due to vaporization or spattering, and accurate control over the degree of penetration.

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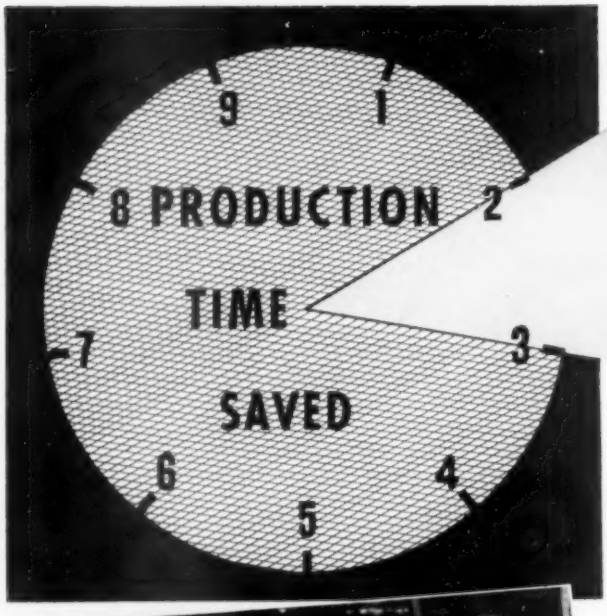


Production Increased 800%

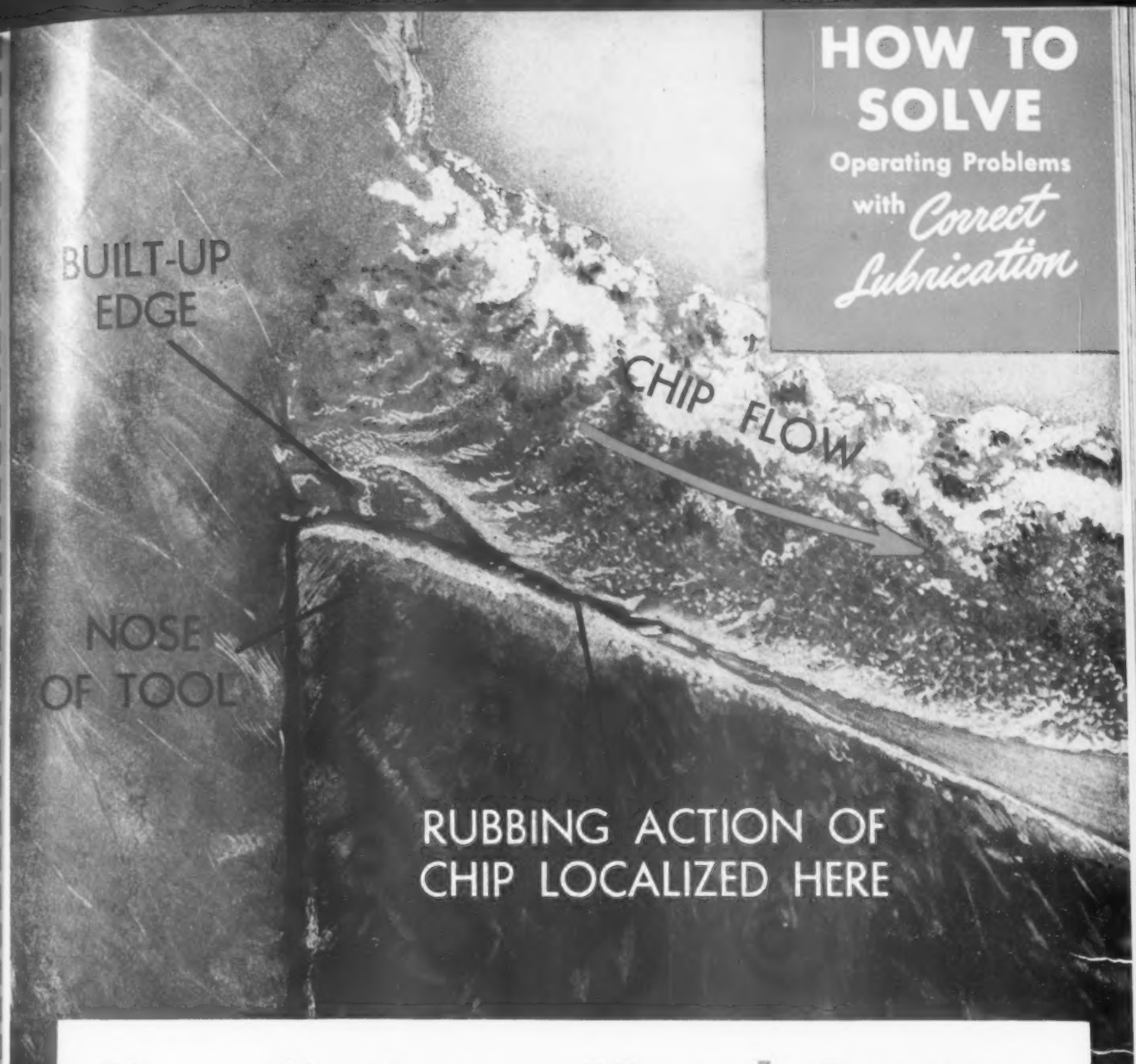
The height of the stack of eight wheels, in the lower picture, compared to the height of the one wheel, shows the *relative* increase in the number of these wheels finished per day, now and formerly. The operation consists of turning the outside diameter, from rim to rim. Formerly, this was done on standard lathes. By putting the job on Monarch-Keller lathes, with electric controls, production was increased 800%. By this method, a thin metal template is drawn over an electrically controlled tracer, and the cutting tool *automatically* follows the specified contour, thus permitting greatly increased speed and accuracy of production.

Monarch-Keller lathes are similarly increasing production of many and varied kinds of war work. If we can help you select the right tool for the right job, we'll gladly work with you.

THE MONARCH MACHINE TOOL CO. • • • SIDNEY • OHIO

MONARCH LATHES *Save Time*

Photographs by courtesy of Hayes Industries, Inc.



New Facts on Metal Cutting

THE PICTURE ABOVE is a photographic enlargement of the cross-section of a tool cutting metal. NOTICE THE BUILT-UP EDGE. That small piece of metal alternately builds up and sloughs off. It is the key to tool life and work finish.

The built-up edge, during its existence on the cutting edge, exerts the pressure which does the actual cutting or shearing of the metal.

Sufficient build-up protects the cutting edge by localizing the rubbing action of the chip some distance from the cutting edge.

Excessive build-up is squeezed between the tool and the work and spoils the finish. *Adequate mobility* prevents this, and enables the built-up edge to slough off with the chip.

The "anti-weld" property of the cutting fluid controls the size and mobility of the built-up edge!

In the laboratory and in practice Socony-Vacuum technicians have isolated and studied many other factors necessary in a cutting fluid.

THIS IS NEW, IMPORTANT INFORMATION. It may be able to vitally improve your rate of production!

GARGOYLE Lubricants

SOCONY-VACUUM OIL COMPANY, INC. — Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) • Magnolia Petroleum Co. • General Petroleum Corp.

CALL IN SOCONY-VACUUM

Following thru for VICTORY

MACHINERY and TOOLS, like Manpower, have a moral obligation to work and fight for Victory with a Vengeance.

Recent changes in our company policy, due to increased demands made upon us by war contractors, has made the following announcement necessary which we believe will enable us to maintain a normal standard of service.

We wish to make public these changes and to pledge to increase our production facilities wherever possible to keep abreast of the ever-increasing demand for these services.

The Eastern Cutter Salvage Corporation will henceforth be known as the Eastern Cutter Corporation.

Quite recently a large addition has been added to our building, new machines have been purchased which will enable us to increase our productive capacity and to speed up service on converting standard tools to specials, recuttinng high speed tools without annealing, reclaiming and sharpening all types of high speed tools, end mills, etc.

Owing to many war contracts, our file department is booked on advance orders for about a year. Consequently we are unable at this time to accept any other orders until such time as our production facilities are enlarged and until further announcement.

We are in a position to secure new standard tools promptly and convert them to specials quickly.

We are jobbers of new milling cutters, end mills, etc., and can fill your need of standards promptly.

The Master Tool Co., Inc., is no longer allied to the Eastern Cutter Corporation. Please send all orders for pneumatic tools and all pneumatic tools for repairs direct to Master Tool Co., Inc., 5605 Herman Avenue N. W., Cleveland, Ohio to facilitate deliveries.

Our Master Chrome Service Division is now located in their new building at 5709 Herman Avenue N. W., Cleveland, Ohio, and is operating 24 hours a day, seven days a week. All orders are re-shipped within 24 hours after they are received.

Today, we are producing 100% for all types of industries engaged in war production. We intend to keep at it until peace is reestablished through Victory. Then you'll want to consider the value of recutting, reclaiming and converting your present supply of cutters from war time production back to peace time manufacturing. When that day comes we will be better equipped than ever before to meet your demands.

Meanwhile, we suggest that you keep your present supply of tools producing at a maximum amount of production by using your cutters for two-thirds of the productive capacity, then have them recut to the next smallest dimension or redesigned for a special operation. When this recut tool has again reached the two-thirds stage, have it recut again. In this manner you will have a constant flow of efficient tools and you will save hundreds upon hundreds of dollars that you would otherwise be spending for new tools and conserve essential High Speed Steel.

In this conservation and recutting of tools, our tool engineers will gladly give you their advice and suggestions, and incidentally you will be helping to bring about a speedy Victory.

EASTERN CUTTER CORPORATION

30-32 Littleton Avenue — Newark, New Jersey

MASTER CHROME SERVICE, INC.

5709 Herman Avenue N. W. — Cleveland, Ohio

EX-CELL-O CYLINDER BORING MACHINE

To left: Ex-Cell-O angular type machine equipped with six spindles to finish bore valve seats and valve guide holes in cylinder head of aircraft engine on a production basis. Each spindle is individually adjustable for depth of cut, as are the tools in the boring bars (boring bars, not shown in picture, are piloted in the fixture).

SPECIAL MACHINES

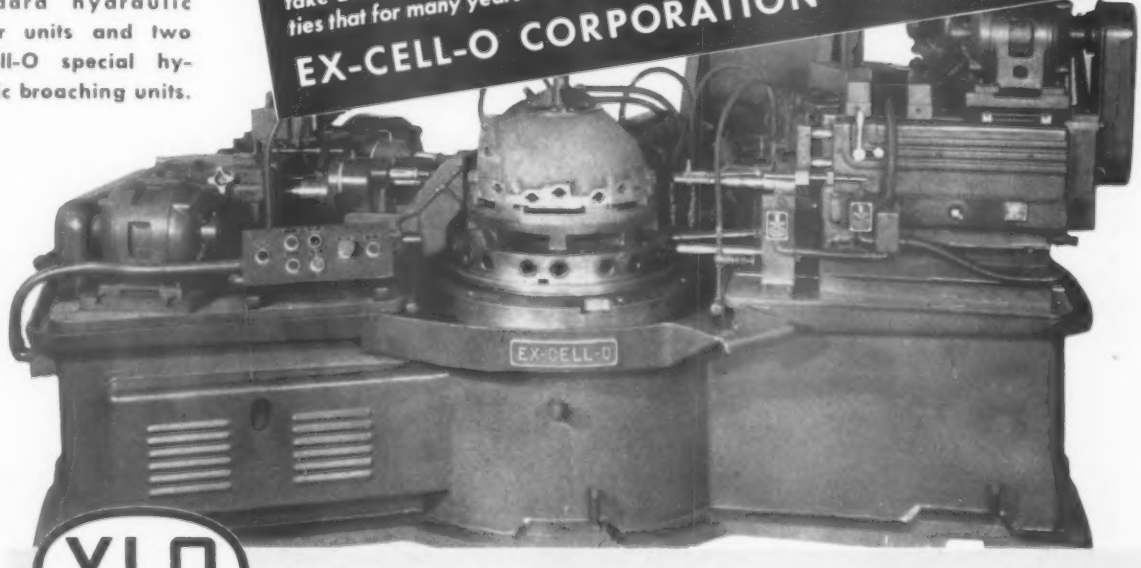
...for today's production... and tomorrow's

For years Ex-Cell-O has been familiarly known as "the headquarters" for special single-purpose machines for turning out accurate parts at a high rate of speed . . . machines that frequently perform numerous operations in one setting of the work and often bring not only a substantial increase in the number of parts produced hourly but also improved quality and reduced unit cost. . . . This is why so many manufacturers have turned to Ex-Cell-O for equipment to meet their war production schedules; why Ex-Cell-O designed machines will figure in the post-war plans of an increasing number of American industries. . . . If you are planning for tomorrow, when the new standards will necessitate costs that are competitive, take advantage of the wide engineering experience and extensive manufacturing facilities that for many years have made Ex-Cell-O a leader in the precision machine tool field.

EX-CELL-O CORPORATION • DETROIT, MICH.

EX-CELL-O SIX-WAY MACHINE

Below: Ex-Cell-O six-way machine for drilling, broaching and reaming valve guide holes in a magnesium crankcase. This machine is equipped with four standard hydraulic power units and two Ex-Cell-O special hydraulic broaching units.



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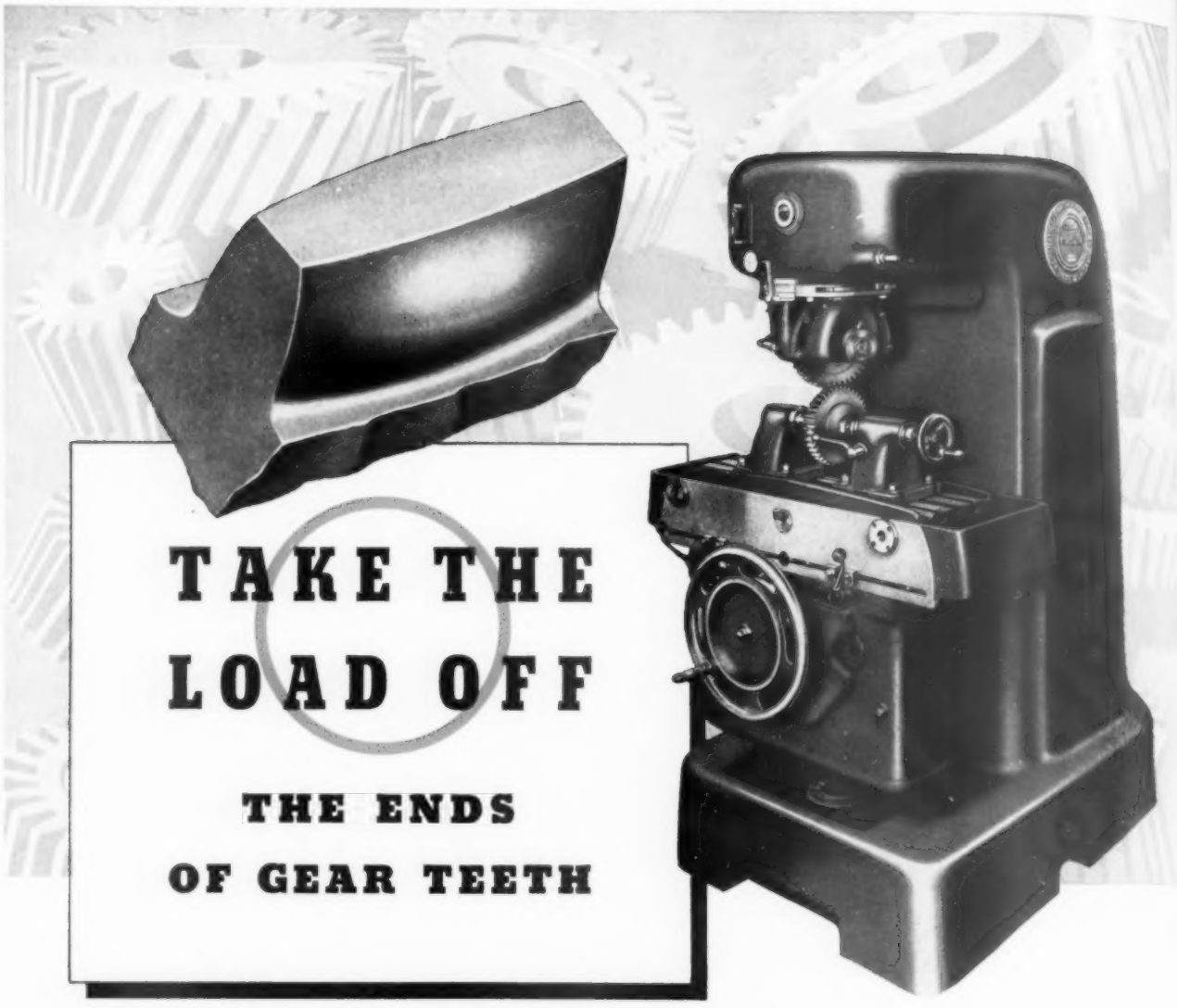


TAKE THE LOAD OFF

THE ENDS OF GEAR TEETH

"End bearing," a concentration of stress on one end of gear teeth, always seriously limits the useful life of the gear and impairs its operation while in service.

You can eliminate end bearing troubles by shaving gear teeth to the ELLIPTOID form. This produces a tooth thicker in the central section than at the ends. The difference in T.T. is usually .0003" to .0005" per inch of face width on each side of the tooth. The amount of crown can be varied to compensate for errors encountered in assembly and because of heat treat distortion. And it takes no more work, no more machine time or cost to produce the ELLIPTOID tooth form than it does the conventional tooth.

If the gear is to be lapped as a final operation, the ELLIPTOID form materially reduces lapping time. In fact, the lapping time on an ELLIPTOID tooth gear is only about one-third that of a comparable gear with conventional tooth form.

Send for *descriptive bulletin on RED RING Gear Shaving and the ELLIPTOID Tooth Form.*

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN · DETROIT, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

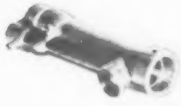
Look at these typical jobs handled better on the

SUNNEN PRECISION HONING MACHINE!

Hydraulic Metering Valve Stem. Hole .156" in diameter, reamed, heat treated, and then honed. Honing 3 times as fast as previous method.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.

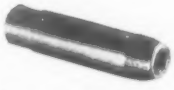
Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.



Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

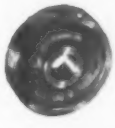
Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Production Increased — Time Saved!



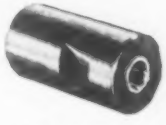
Cast Iron Valve Stem Guide. ½ to one thousandth removed —220 pieces per hour. Better finish and straighter hole.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.



Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Idle Valve Guide. Honing after grinding holds a .0002" limit necessary for accurate idling.



Shell Loading Die.

Closer Tolerances — More Accurate Work

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Compressor Yoke. Alignment maintained and better finish produced.

Mild Steel Clevis. Honing corrected errors of previous operations and maintained true alignment of two holes.

Errors Corrected — Alignment Maintained

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

Bearing. A very small part 2 micro inch finish necessary.

Carbureter Idler Pump. Smooth, straight-line finish in blind hole prevents piston leakage.

Ceramic Insulator. Honing used to eliminate roughness inside ceramic tube.

Super-Smooth Finish!

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

The basic price of the Sunnen Precision Honing Machine is only $195! And operating costs are low.

No jigs or fixtures needed — work can be held in the hands. Relieves big internal grinder for other jobs.

Wide range — handles any internal diameter from .185" to 2.625".

Protect your investment in time, labor, and materials in your previous operations by using the Sunnen method for the LAST operation.

Does Not Require Skilled Labor!

Here's good news — girls in 'teens can be trained to handle jobs in "tenths" in a few hours.

Sunnen guaranteed accuracy assures fewer rejects and absolute interchangeability of parts.

One of our sales engineers will be glad to help you solve your honing problems. Or, if you prefer—write for free bulletin giving complete information.

SUNNEN PRODUCTS COMPANY, 7932 Manchester Ave., St. Louis, Missouri

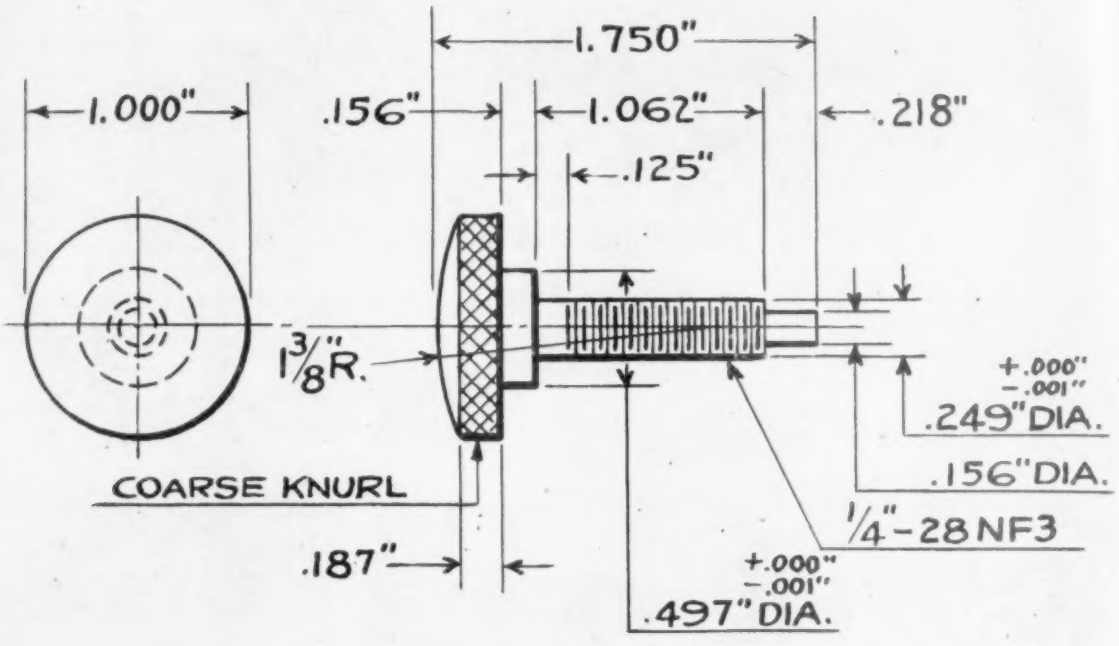
Canadian Factory, Chatham, Ontario

SUNNEN

WORK: SCREW **MATERIAL:** SAE 1020

OPERATION: TURN, KNURL, THREAD, FORM, CUTOFF

MACHINE: FOOTBURT AUTOMATIC SCREW MACHINE



TANTUNG CUTS CUTTING COSTS 450% UNDER ACTUAL WORKING CONDITIONS!

This record is not one that was made under ideal or test conditions. This **TANTUNG** performance datum was supplied from actual shop records of a leading war-plane plant.

TANTUNG actually cut the cost per piece 450%.

TANTUNG cut actual working time *by the same amazing ratio.*

If you are now using high-speed steel in any cutting operation, test **TANTUNG** and let *your* shop records prove the superiority of this new miracle cutting metal. **TANTUNG** sharpens easily and holds its cutting edge longer. Send today for complete information on this new cost-cutting tool.

PERFORMANCE DATA

TOOLING	ACTUAL TIME	PIECES PER HR.	COST PER 100 PIECES	SPEED SFM
HIGH-SPEED STEEL	4.30	13.9	$7.17	640
TANTUNG	.95	63.2	1.58	1060

REMARKS: The saving in time, money and increase in pieces per hour in this operation is tremendous. The superiority of **TANTUNG** over high-speed steel is clearly indicated.

CUSTOMER: A large war-plane manufacturer.

4324

Ramet

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS · DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

IN CANADA: CARBIDE TOOL AND DIE COMPANY, LTD., HAMILTON, ONTARIO

History relates that when Faraday demonstrated electricity to Gladstone, the great statesman remarked, "But what earthly good is that?" . . When Bell's invention of the telephone was reported to U. S. Grant, the general observed, "But what could it ever be good for?"

GLADSTONE and Grant once went into business together. Combining the happy qualities of diplomacy and aggression, they soon did a right brisk business in such staples as ear trumpets, harness and sundries.

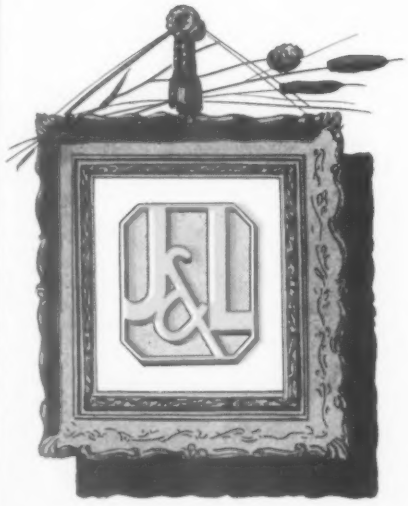
They had two bright young fellows working for them named Mike Faraday and Alex Bell, and if ever a company should have gone to town, it was G. G. & Co. For it seems that Mike had been tinkering with harness for a new kind of horsepower, while Alex had invented a new kind of hearing aid . . . but they couldn't interest the management in the future of these things.

So Mike and Alex left and went into business for themselves, and they've been doing nicely ever since. While Gladstone, Grant & Co. stayed in harness and tin hearing aids, and folded like a tent in a heavy wind.

* * * * *

There's a point to this little fable: Today there are many promising businesses — in the hands of capable management — that are also going to fold like tents when the post-war trade winds blow.

The success of many businesses after this war will depend upon the planning that is being done now. On any problems involving the use of precision machine tools, we urge you to call upon our engineers — as many of America's leading companies have been doing for more than a century. Call upon them now!



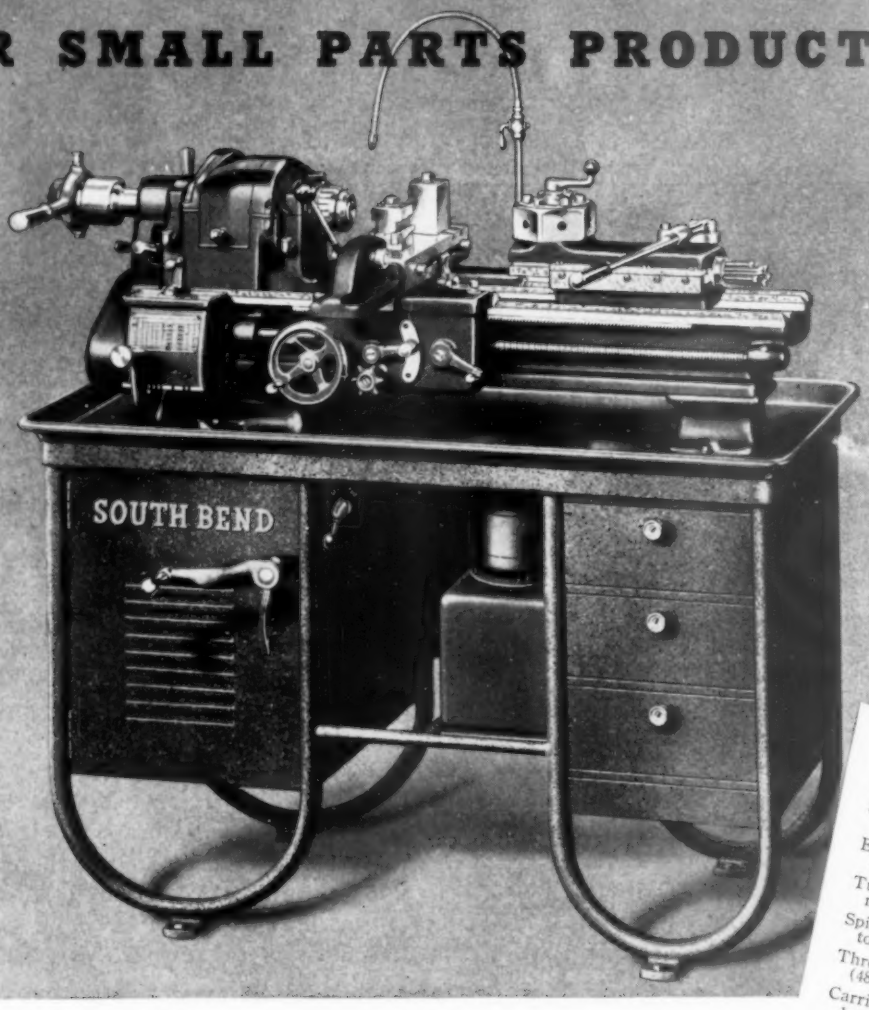
Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Threading Dies

JONES & LAMSON MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.

Profit-producing Machine Tools

FAST-ACCURATE

FOR SMALL PARTS PRODUCTION



★ BUY U.S. WAR BONDS ★

Specifications

Hole thru spindle—1⅛"
Collet capacity round—1"
Swing over bed and saddle wings—10⅝"
Effective feed of turret slide—4"
Turret face to spindle, maximum—19⅜"
Spindle speeds (12)—50 to 1357 r.p.m.
Thread cutting feeds, (48)—4 to 224 per inch
Carriage power feeds, longitudinal (48)—.0015" to .0836"
transverse (48)—.0006" to .0309"

South Bend (Series 1000) Turret Lathe

Designed primarily for machining small, accurate parts, the Series 1000 South Bend Turret Lathes have proved to be highly efficient in hundreds of war production plants. Because of their versatility and wide range of spindle speeds they are readily adaptable to many classes of operations.

These lathes have the stamina to maintain close tolerances at top speed on heavy production schedules. Conveniently placed, easy-acting levers for operating the turret, cross slide and collet save time and reduce operator fatigue. In addition to the handlever cross slide, the carriage has compound rest cross slide with power operated feeds for turning and facing operations, also lead screw and split nut feeds for cutting screw threads.

Lathes in this series are available in both metal bench and floor leg models. South Bend Toolroom Lathes and Engine Lathes are made in five sizes ranging from 9" swing to 16" swing. Write for a copy of Catalog 100C.

ARMY-E-NAVY

SOUTH BEND LATHE WORKS

SOUTH BEND, INDIANA, U. S. A. • LATHE BUILDERS FOR 36 YEARS

THIS IS THE WHEEL MR. JONES*

● Maybe you were stumped by grinding jobs before, but they won't worry you any more.

300 shapes and sizes—every grade and grain—there is a Chicago Mounted Wheel custom-built to take on *any* grinding problem. Each wheel is a whirling point of power that turns your jobs out smooth—and in a hurry.

PROMPT DELIVERY

Action is the keynote from the moment your order comes in. Our wartime set-up concentrates on mounted points and grinding wheels 3" in diameter and under. —Production is stepped up and keeps pace with demand. Another advantage to you is our central location.

NEW CATALOG—Shows Chicago Mounted Wheels in actual colors, also portable electric tools and time-saving accessories.

CHICAGO WHEEL & MFG. COMPANY

America's Headquarters for Mounted Wheels and Small Grinding Wheels.

1101 W. Monroe St., Dept. TE
Chicago, Illinois

*Half a century of specialization has established our reputation as *the* small wheel people of the abrasive industry.

TEST WHEEL FREE—Tell us the job, type grinder and size wheel you use and we'll send one prepaid.

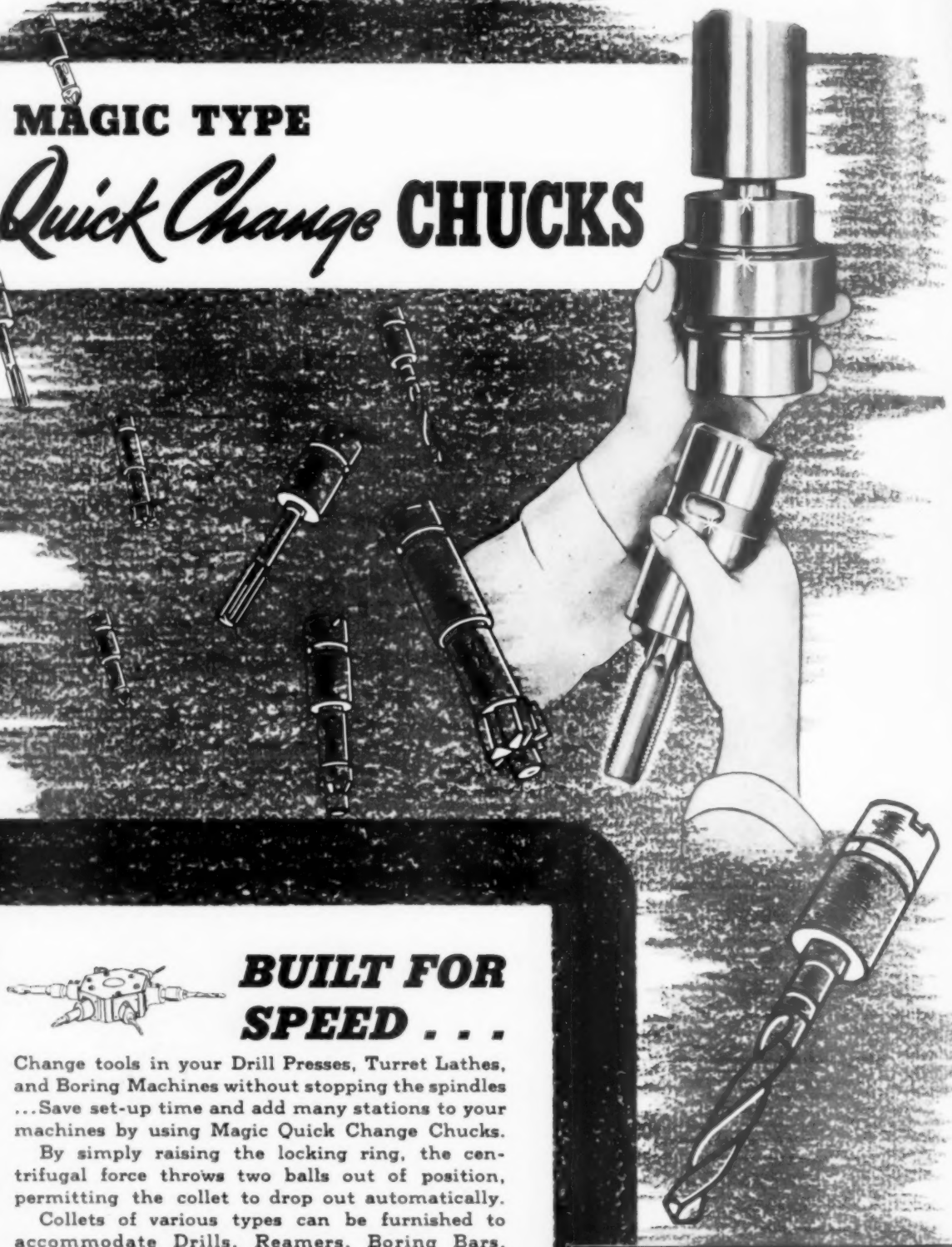
TE-8

☐ Send Mounted Wheel Catalog
☐ Free Wheel. Size .....
☐ Also interested in Grinding Wheels

Name .....

Address .....

MAGIC TYPE
Quick Change CHUCKS



BUILT FOR SPEED . . .

Change tools in your Drill Presses, Turret Lathes, and Boring Machines without stopping the spindles ...Save set-up time and add many stations to your machines by using Magic Quick Change Chucks.

By simply raising the locking ring, the centrifugal force throws two balls out of position, permitting the collet to drop out automatically.

Collets of various types can be furnished to accommodate Drills, Reamers, Boring Bars, Counterbores, Core Drills, Taps and Special Tools.

Our Tool Engineers will gladly assist you in adapting Magic Quick Change Drives to your production problems. Send us sketches or blue prints for recommendations and quotations.

Scully-Jones AND COMPANY

1901 SOUTH ROCKWELL STREET • CHICAGO, U. S. A.

DOALL

MACHINES Do a Job at CONSOLIDATED VULTEE

At the Fort Worth home of B-24 Liberator Bombers and C-87 Liberator Express Transports. At left, Operator Jackson is making a bucking bar from a pattern drawn on a block of cold rolled steel. Above, he is cutting sheet aluminum. This is only one of many DoAlls in this modern plant. Jackson has been operating this machine for more than eight months and declares it is invaluable because of its fast precision cutting and the fact that it saves both time and metal.

HERE ARE THE FIVE DOALL MODELS PRICED FROM $1000 TO $5000 *Each Complete with Motor*

MACHINE OF MANY USES

That's what Consolidated Vultee calls the DoAll, and it's a fact because

- ★ DoAll does internal and external cutting of metals, alloys, plastics, etc., following a hairline design with unerring precision.
- ★ Cuts out production parts, jigs, dies, fixtures, cams, templates, special tools, etc.
- ★ Cuts out 100 or more shapes at one time from stacked sheets.
- ★ Makes short runs of stampings or forgings.
- ★ Cuts out blocks, sheets, bars or tubing.
- ★ Relieves heavy machine tools for other work.

DoAll is on the job on regular production lines, in experimental rooms, tool rooms, repair departments. DoAll smashes bottlenecks—beats former time records—gets jobs through on time.

"DoAll on Production"

Interesting book, well illustrated, about DoAll performance in many plants. Write for copy today.

Investigate this modern machine that does hundreds of shaper, milling and lathe jobs in a fraction of the time.

CONTINENTAL MACHINES, INC.

1304 S. Washington Ave., Minneapolis, Minn.

DoAll Offices in 25 cities, each in charge of a trained sales engineer to give you quick service on Contour Machines, DoAll Band Saws and Files, Gage Blocks and Surface Grinders.

DOALL SURFACE GRINDER

Gives "tool room precision" even on long - run grinding jobs. Two models. For wet or dry grinding.

SAVAGE TOOL CO., Savage, Minn.

DOALL GAGE BLOCKS

The foundation of uniform measurement. 81-piece sets made in 3 different accuracies.

DOALL BAND SAWS

A wide range of widths and styles. 100 feet in each Strip-out Container.

DOALL COMPANY, Des Plaines, Ill.

Shorten the Life of Schickelgruber with DOUBLE-LIFE END PLATES

POINTERS FOR LONGER TOOL LIFE

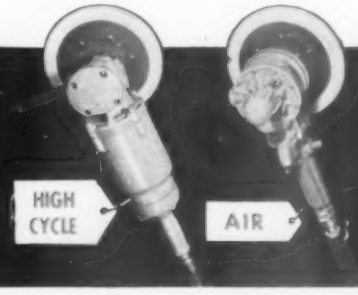
- Oiling and Greasing Grinders and Drills.
- Keeping Air Supply Clean.
- Elimination of Moisture.
- Maintaining Blades.
- Ball Bearings.
- Doubling Life of End Plates.
- Care of Governors.
- Safety Precautions.
- Starting New Tools.
- Trouble-Shooters.
- Check Chart.
- Discussed fully in "Keep 'em Running" Manual.

THE end plates of Rotor "Powerplus" Grinders take the lateral thrust of the rotor. With proper lubrication, they last a long time. When they do become worn, however, you can do this:

Switch them like you would your auto tires when worn uneven. Transfer each plate to opposite ends of the rotor so the unused face will get the wear. They'll last twice as long. You save replacement cost and maybe a serious delay for a new part. Every little bit like that helps to shorten the life of Adolph S.—alias Hitler.

The Rotor Maintenance Manual, "Keep 'em Running" is full of practical pointers like this on the care of AIR tools. The high points also are given on a handy wall chart. These . . . or a similar plan on HIGH-CYCLE tools . . . are free to plants that will put them to work for Victory.

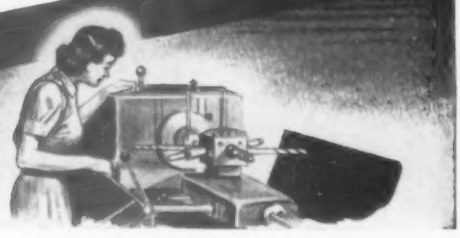
THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

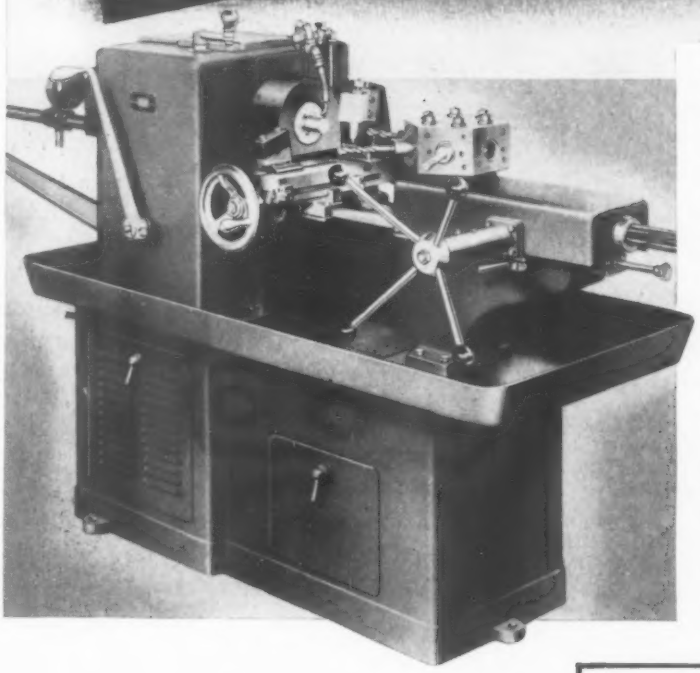


SIMPLICITY

of the Oster No. 601 RAPIDUCTION LATHE

Speeds Training of New Operators





Certainly you can't turn new operators loose on complicated machines. But you CAN relieve the pressure on their highly trained operators by diverting a wide variety of small diameter bar and chucking jobs to Oster No. 601 "RAPIDUCTION" Lathes.

This SIMPLIFIED machine is easy for the beginner to understand and operate efficiently after a short training period.

Ample proof of that statement is available. For example, one manufacturer has 139 Oster No. 601 Lathes operated mostly by people without prior machine shop experience.

For quick response to your request for complete details on the Oster No. 601 "RAPIDUCTION" Lathe, use convenient form below*.

No Time Out to Celebrate Our 50th Anniversary
1893-1943

OSTER

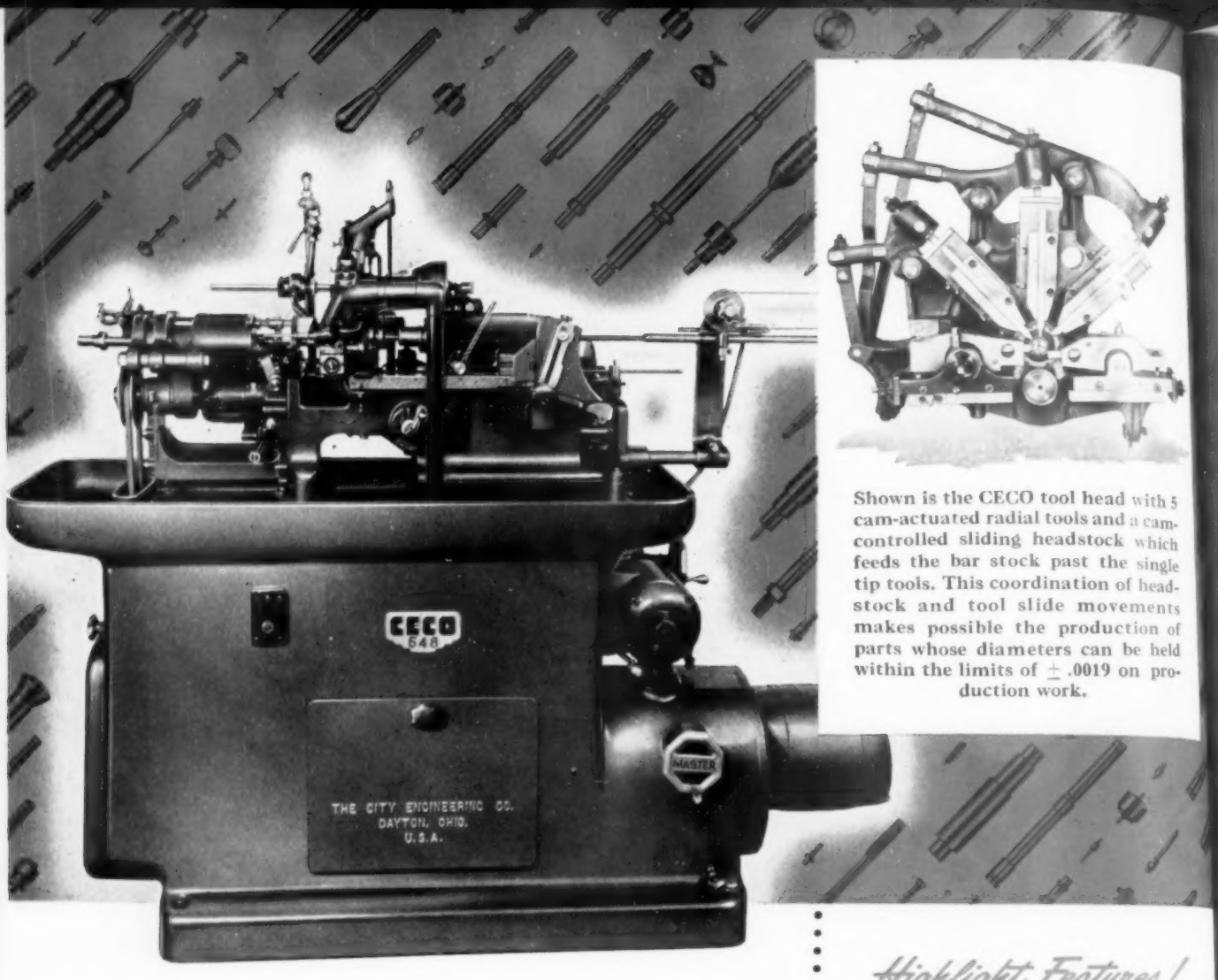
THE OSTER MFG. CO., 2063 E. 61st ST., CLEVELAND, OHIO, U. S. A.

*O. K. Oster. We're interested in the No. 601 machine.
☐ Send Catalog No. 601. ☐ Ask your nearest distributor to see us at once. (Check either or both of above requests.)

NAME_____

ADDRESS_____

CITY_____ STATE_____



Shown is the CECO tool head with 5 cam-actuated radial tools and a cam-controlled sliding headstock which feeds the bar stock past the single tip tools. This coordination of headstock and tool slide movements makes possible the production of parts whose diameters can be held within the limits of ± .0019 on production work.

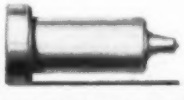
Ceco gives One-Operation

PRECISION PRODUCTION

of Intricate Parts with Single Tip Tools

CECO REVOLUTIONIZES THE MASS PRODUCTION OF EXTREMELY ACCURATE HIGH FINISH PARTS

America's bellwether makers of precision instruments have found that the CECO Automatic Screw Machine gives them economy, accuracy and high finish precision production of intricate parts, such as those shown on this page, undreamed of with conventional screw machines.



DIESEL SUBMARINE ENGINE PART CECO-MADE IN ONE OPERATION

This part was generated in one operation to extremely high finish without grinding, using single tip tool, which leaves no tool or chatter marks as with formed tools.

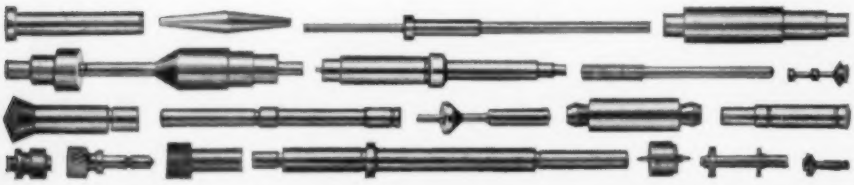
MATERIAL: Tough alloy steel.

DIAMETER: Extremely close tolerance.

Write For Complete Illustrated Data

THE CITY ENGINEERING COMPANY ★ DAYTON, OHIO

Since 1909, Designers and Builders of Tools, Dies, Jigs, Fixtures, Gages and Special Machinery



Highlight Features!

BAR CAPACITY: Available in ⅜" and ½" bar capacity.

4 or 5 RADIAL TOOL SLIDES.

MAXIMUM TURNING LENGTH: 4" with flat cam.

MASTER SPEED RANGER: Varies Spindle speed from 675 to 7500 R.P.M. at the turn of a handwheel.

PRECISION ROLLER BEARING SPINDLE: Always in adjustment.

CONSTANT RISE FEEDING MECHANISM gives extreme feeding accuracy.

CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES

THREE MODELS:—4-3-8, 5-3-8, 5-4-8

HA-HA! HE THOUGHT A SNAKE BIT HIM! I DON'T SEE HOW A GUY COULD BE ABSENT-MINDED ENOUGH TO THINK THAT A SNAKE WOULD BE IN A BIG MODERN PLANT LIKE THIS!
THAT'S JUST TH' REASON! IT'S SO MODERN THAT ONLY A FEW MONTHS AGO WE WAS PICKIN' WILD BERRIES RIGHT ABOUT HERE -- AND THERE WAS SNAKES IN TH' BUSHES!
T. M. REG. U. S. PAT. OFF.
COPR. 1943 BY NEA SERVICE, INC.
MEMORY LANE
J.R.WILLIAMS
3-5

THAT WAS THE DAY HE TALKED THE BOSS INTO "CHIP BREAKERS."

Chip Control avoids dangers and delays caused by long, hot, tough chips of alloy steel. Chip Control yields **short chips** that are more marketable, bring a better price, and provide a means for speedy recovery of alloys on a national scale.

For a proved method of producing **short chips** with Firthite Sintered-Carbide Cutting Tools, refer to pages 41, 42, and 43 of the Firthite Users' Handbook. Ask for Handbook FE-101.

ARMY E NAVY
Firth-Sterling
STEEL COMPANY
Offices: McKEESPORT, PA. · NEW YORK · HARTFORD · PHILADELPHIA · CLEVELAND · DAYTON · DETROIT · CHICAGO · LOS ANGELES

TECO CARBIDES hold cutting edges longer!

Large and small production shops using TECO Carbide Tools, consistently report more pieces between grinds, than with other tools used. Result . . . less down-time, more production.

You get more out of TECO Carbide Tools because we put more into them. TECO Carbides are harder, denser, more uniform—thus more resistant to wear and breakage. They cut at higher speeds—hold accurate tolerances for longer runs.

If you've been thinking "all Carbide tools are pretty much alike," try a run with TECO Carbide Tools and let results speak for themselves. Available in grades, styles and sizes for practically every machining need. Write for catalog giving specifications.

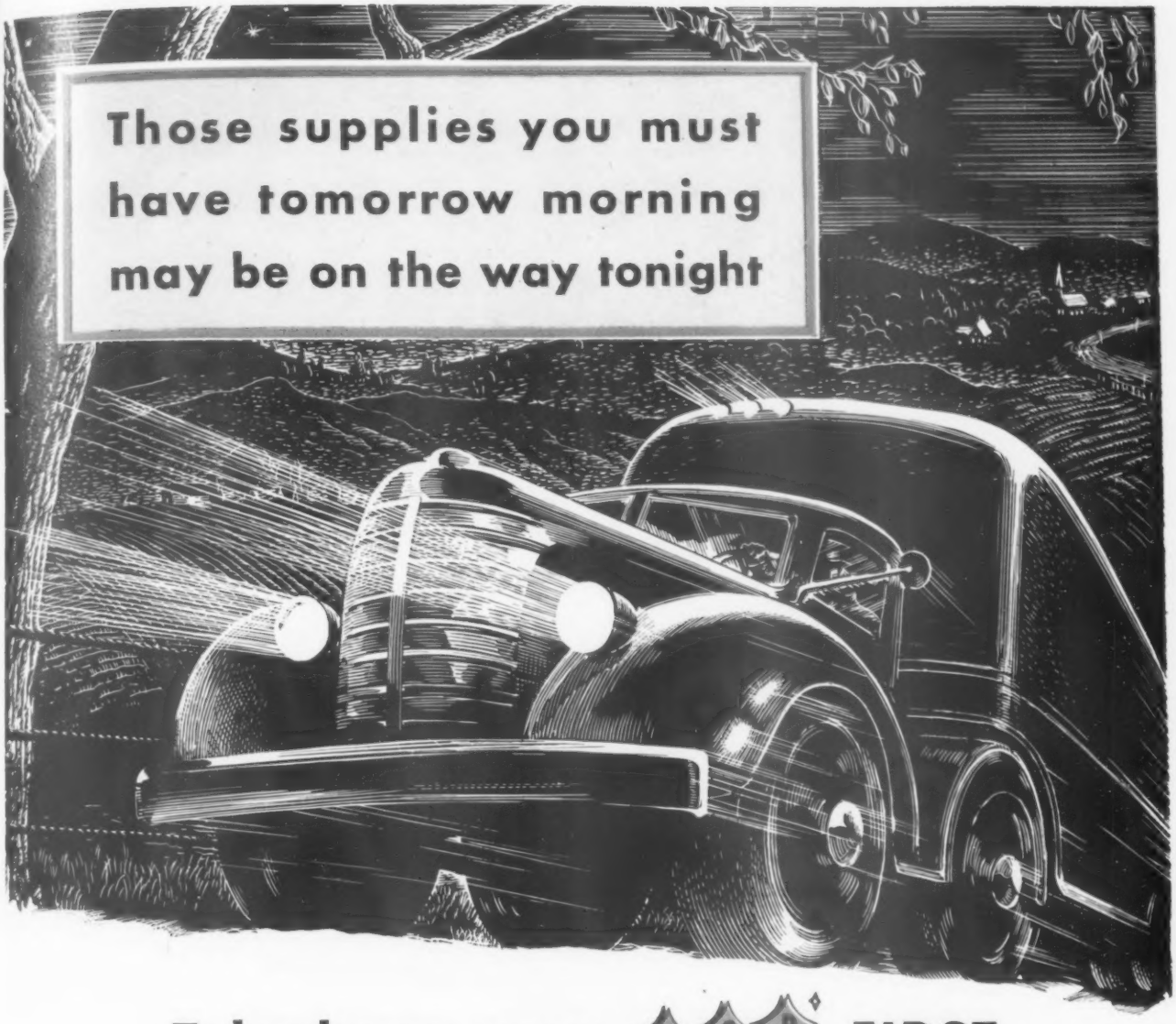
TUNGSTEN ELECTRIC CORPORATION • 570 39th Street, Union City, N. J.

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO CARBIDE TOOLS

Pioneers in Tungsten Carbides for over a Quarter Century

TELO



Telephone your ◆ISD◆ FIRST

What would *you* do, if you found at 4 p.m. that your assembly line was running out of critical parts—with the manufacturer 500 miles away?

Right! You would telephone your ◆ Industrial Supply Distributor *first.* And it's a fair break that he might be able to deliver from stock—or could "beg, borrow or steal" enough to keep you going until his next shipment came in.

It's a vital part of your Industrial Supply Distributor's business to know what materials you must have to keep your operations on schedule. He orders ahead for you and all his other customers. He buys on priority—he buys as much as he can—he buys as often as he can.

Why not simplify *your* purchasing in these short-handed times? Order from your Industrial Supply Distributor—check with him ahead of your needs. The chances are he will say in effect:—"sure—that stuff is coming through from the factory by truck—*tonight!*"

ARMY NAVY

ARMY E NAVY

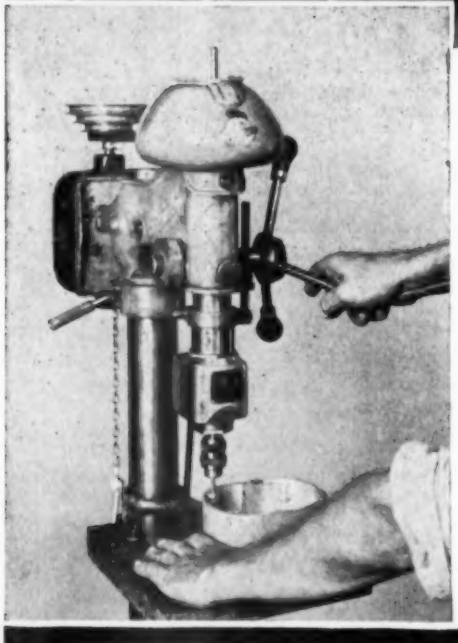
The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

Jarvis POWER TOOLS



JARVIS TAPPING ATTACHMENTS

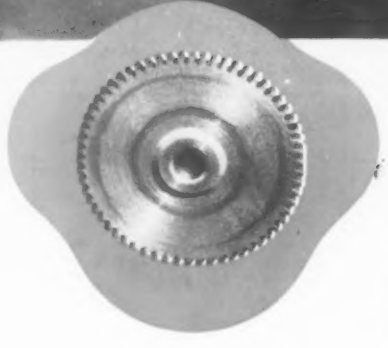
drilling . . . countersinking . . . and TAPPING

In a continuous flow. No waste motion. No additional handling of parts. Jarvis Tappers — THE STANDARD on your multiple spindle drill presses. Capacities from No. 2-56 to 2".

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

HOBBING A SMALL, ACCURATE GEAR FEATURING FINE FINISH AND QUIET RUNNING ABILITY



ON A BARBER-COLMAN No. 3 HOBBING MACHINE

These illustrations show a close-up of the hobbing operation, and one of the finished pieces, of a shutter gear used in a prominent make of a movie sound projector. No picture could show how quietly this gear runs, nor is it practical to photograph the fine finish and accuracy which makes it so quiet. These important qualities are indicated by sensitive test instruments, but the final test is the satisfaction expressed by thousands of users of the projector, and by its ability to produce clear, brilliant, flickerless movies. A Barber-Colman No. 3 Hobbing Machine is used to generate the teeth on this shutter gear, because this machine has demonstrated its ability to produce gears that must meet exacting specifications. For example, this gear is held to less than .001″ backlash, and a pair of them must roll within .0005″ on pitch diameter as well as rotate freely under any conditions in a gravity feed test instrument. For consistent, high-quality accuracy and finish, on production work, use Barber-Colman Hobbing Machines.

SET-UP OF THIS JOB

Piece — Movie projector shutter gear.

Material — Aluminum alloy.

Dimensions — 1.280″ O.D. .080″ face, 62 teeth, 50 pitch spur form.

Machine Set-up — feed .008″ per rev. of work, hob speed 388 r. p. m. paraffin oil cutting fluid.

Production — approximately 60 gears in 10 hours.

Hob — B-C 1⅞″ x 1⅞″ x taper hole. Produced 200 pieces per setting and 1000 pieces per sharpening.

Piece is clamped on special arbor and held between centers.

Note burring tool attachment.

HAND BOOK "L"

How can you get maximum life from hobs? One important factor is proper sharpening, which is thoroughly covered in a special section of the new Barber-Colman Handbook "L", pages 271-282. This book is available when requested on company letterhead signed by person in key position.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 213 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

Handle more jobs!

on your G & L HORIZONTAL with this attachment

Get Increased Flexibility and Multiple Operations on Occasional Turning, Boring and Facing Operations...

Short-run occasional jobs, whose size and shape make them unwieldy to handle on a chucking machine can be bored, faced and turned with this attachment. It is provided with two tool slides with six separate feeds, from .009″ to .118″ per revolution.

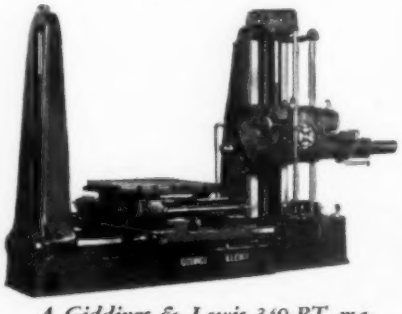
A simple lever controls the direction of feed to the tool slide and a micrometer adjustment for setting the tool slide to .001″.

Removing or mounting the head takes but a few minutes and all adjustments are easily and quickly made.

Increases Flexibility Further When Used With Indexing Table...

Greater versatility can be added to your G & L when using an indexing table in conjunction with the continuous feed facing head. Jobs like large pipe fittings (tees and ells) are easily bored, faced and back faced on all surfaces with a standard machine equipped with rotary indexing table and continuous feed facing head as shown at right.

This attachment will add to the productivity of your equipment or help simplify jobs of the type shown at the right.

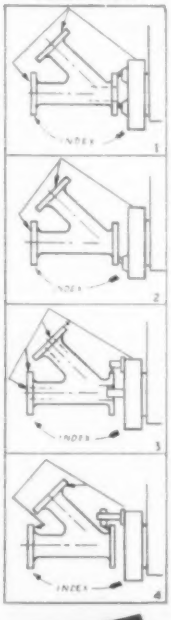


A Giddings & Lewis 340-RT machine with built-in power revolving table and a continuous feed facing and boring head mounted in position.

Speeds Up and Simplifies Operations Like These:

Jobs of this type, which are awkward or impossible to handle on chucking equipment, can be done in a hurry with the G & L continuous feed facing and boring head in conjunction with a G & L rotary indexing table. This fitting, for instance, can be completely machined in *one* setting.

PLAN VIEW



Operation 1
Rough face flange using two tool bits.
Index and perform same operation on other two faces.

Operation 2
Finish face flange using single point tool.
Index and perform same operation on other two faces.

Operation 3
Turn O.D. of flange and bore simultaneously.
Index and perform same operation on other two faces.

Operation 4
Back face flange using single point tool in telescopic tool holder.
Index and perform same operations on other two faces.
Unload.

Additional Data
is contained in this folder. When making inquiry please indicate your business connection and type and size of machine used. Ask for Bulletin No. 75.

GIDDINGS & LEWIS MACHINE TOOL CO.

132 DOTY ST., FOND DU LAC, WISCONSIN

★WPB ORDER M-24C REQUIRES YOU TO
Classify Scrap
at the Source-
SEGREGATE INTO THESE OFFICIAL CLASSIFICATIONS:
1. Nickel Steels (Ni ½%-2%) and Nickel-Chromium Steels (Ni 1%-2.25%) as 2100, 3100, 3200 series
2. Nickel Steels (Ni 2%-5.25%) as 2300, 2500
3. Nickel-Chromium Steels (Ni 2.25-5.25%) as 3300, 3400
4. Nickel-Molybdenum Steels (Ni 1-5.25%) as 46-4800
5. Ni Cr Moly Steels (Ni 1% and under) as 86-87-88-8900
6. Ni Cr Moly Steels (Ni 1%-5.25%) as 4300
7. Molybdenum Steels (Moly 0.15-0.65%) as 4000, 4100, 80-81-82-83-84-8500
8. Molybdenum Steels (Moly over 0.65%) as Mn-Mo Bullet Core
9. Chromium Steels and Chromium-Vanadium Steels (Cr 0.70-1.75%) as 52100-5100-6100
TOOL STEELS 10. Class A High Speed Steels (containing [1] at least 0.60% carbon and 3.0% Moly or [2] at least 0.60% carbon, not over 7.0% tungsten and at least 3.0% molybdenum) 11. Class B High Speed Steels (at least 0.55% carbon and 12% tungsten 12. Tungsten-bearing Hot Work Steels
CORROSION AND HEAT RESISTING 13. Chromium 10-14% inclusive 14. Chromium 15-18% incl. 15. Chromium over 18% 16. Chromium 16-20% incl. and Nickel 8-10% incl. 17. Chromium 21-30% inclusive, Nickel 11-20% inclusive. 18. All other grades of corrosion and heat resisting alloy irons and steels containing chromium, nickel, molybdenum, cobalt, or copper.

Segregating scrap, as required under WPB Order M 24 C, is a difficult task, but it is absolutely necessary — there is no alternative. Production of fighting equipment made from alloy steels must not bog down.

War has shut the door on many sources of supply for essential elements, such as chromium, vanadium, nickel, which put the "fight" in steel. As a result, most of the alloys must be redeemed from the steel itself. For instance, in the manufacture of a precision part of an airplane, only 20 per cent of the original steel ingot is actually used. The other 80 per cent becomes scrap in the form of turnings and other by-products of the various machining and finishing operations.

Recovery of the essential alloys from machine turnings, chips, etc., would be comparatively simple if the elements could be separated in the furnace, but this is impossible. Scrap of unknown analysis may not only mean waste or loss of the alloys, but may ruin an entire heat of steel. Properly classified scrap saves alloying materials as well as manufacturing time.

To make enough alloy steel for the demands of war, scrap must be segregated and identified by the specific classifications outlined by the War Production Board. The only way this job can be done is at the source—your machines where the scrap turnings are produced. If you have not already done so, we urge you to review your shop procedure on the handling of scrap.

COPPERWELD STEEL COMPANY WARREN, OHIO

AIRCRAFT QUALITY STEELS · NITRALLOY STEELS
STAINLESS STEELS · BEARING QUALITY STEELS
CARBON TOOL STEELS · ALLOY TOOL STEELS

ARISTOLOY STEELS

100,000 GAGES

FOR ONE JOB!

One of the leading builders of airplane engines has that tremendous number of gages in constant use—a fact that portrays vividly the precision requirements of modern manufacturing.

Without this accurate dimension control, our American straight-line production methods would hardly be practical.

Many of the gages used in hundreds of war plants carry the PM Diamond Emblem of The Pipe Machinery Company.

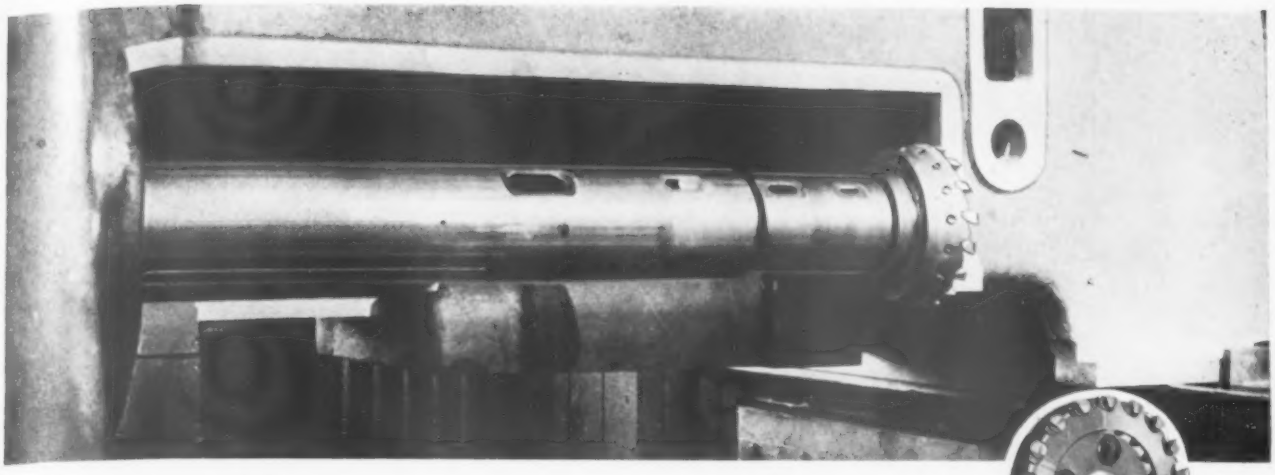
Gage users have learned to regard this emblem—on a gage or tool—as assurance of high standard accuracy, precision and perfect finish.

A large number of standard gages are stocked for immediate shipment. And prices and delivery dates will be sent on request, to cover gages designed to meet special requirements.

PM CO

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS



LOVEJOY CUTTERS *refuse to "Walk"*

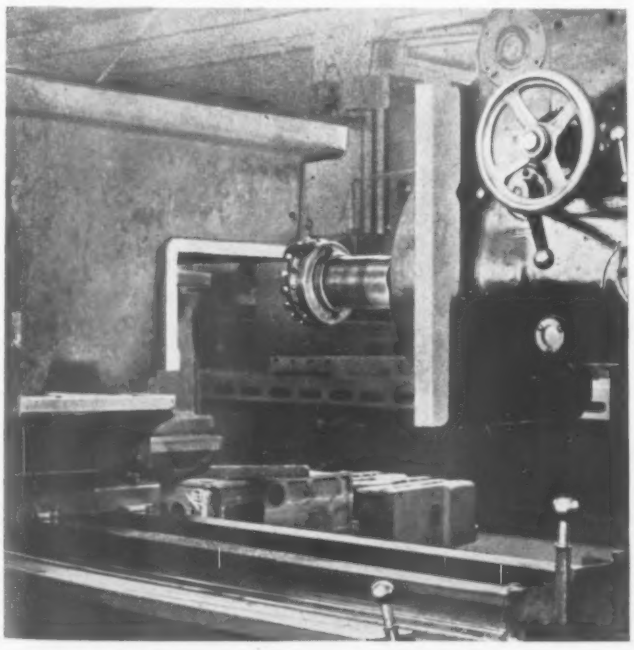
ON JOBS REQUIRING EXTREME OVERHANG OF THE MILLING SPINDLE

Overhang on milling spindles is often like a "hang-over" for all the headaches involved. The problem presented by the job shown here, however, was completely solved by using a *free cutting* Lovejoy Milling Cutter. It takes a combination of the best machine and tool to prevent "walking" on jobs like this.

Universal Boring Machine Company uses these cutters exclusively for precision milling their boring machine bed castings, as well as for dozens of other milling jobs throughout the plant.

As an added feature, Lovejoy cutters, with *positive-locking* blades, reduce power costs, down time and sharpening costs. For complete details on these superior tools, mail the coupon today.

PHOTOS COURTESY UNIVERSAL BORING MACHINE CO.



LOVEJOY TOOL CO., Inc.

Springfield, Vermont, U.S.A.

Please send me the Lovejoy General Catalog.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

T.E.

GREATER PRODUCTION EFFICIENCY *Round-the-Clock* WITH ARO PNEUMATIC TOOLS

● Trained ARO Field Engineers are at your call to show you how ARO Pneumatic Tools can increase your production...and reduce worker fatigue. Because of light weight in relation to great power... ARO Pneumatic Tools are particularly preferred by women.

Today, when tools must be operated Round-the-Clock, ARO'S simple design and dependability are proving their outstanding superiority on all types of small tool operations such as drilling, grinding, screw-driving, nut-setting and many special applications.

To maintain this Round-the-Clock operation ... to foil that saboteur "Idle Tools"... ARO offers immediate delivery of repair parts and excellent field service at all times. Investigate the *double* advantage of using ARO Pneumatic Tools. Write for catalog.

You are especially invited to ask ARO Field Engineers to help solve your *special* tool problems and the adaption of standard tools to your own operations.

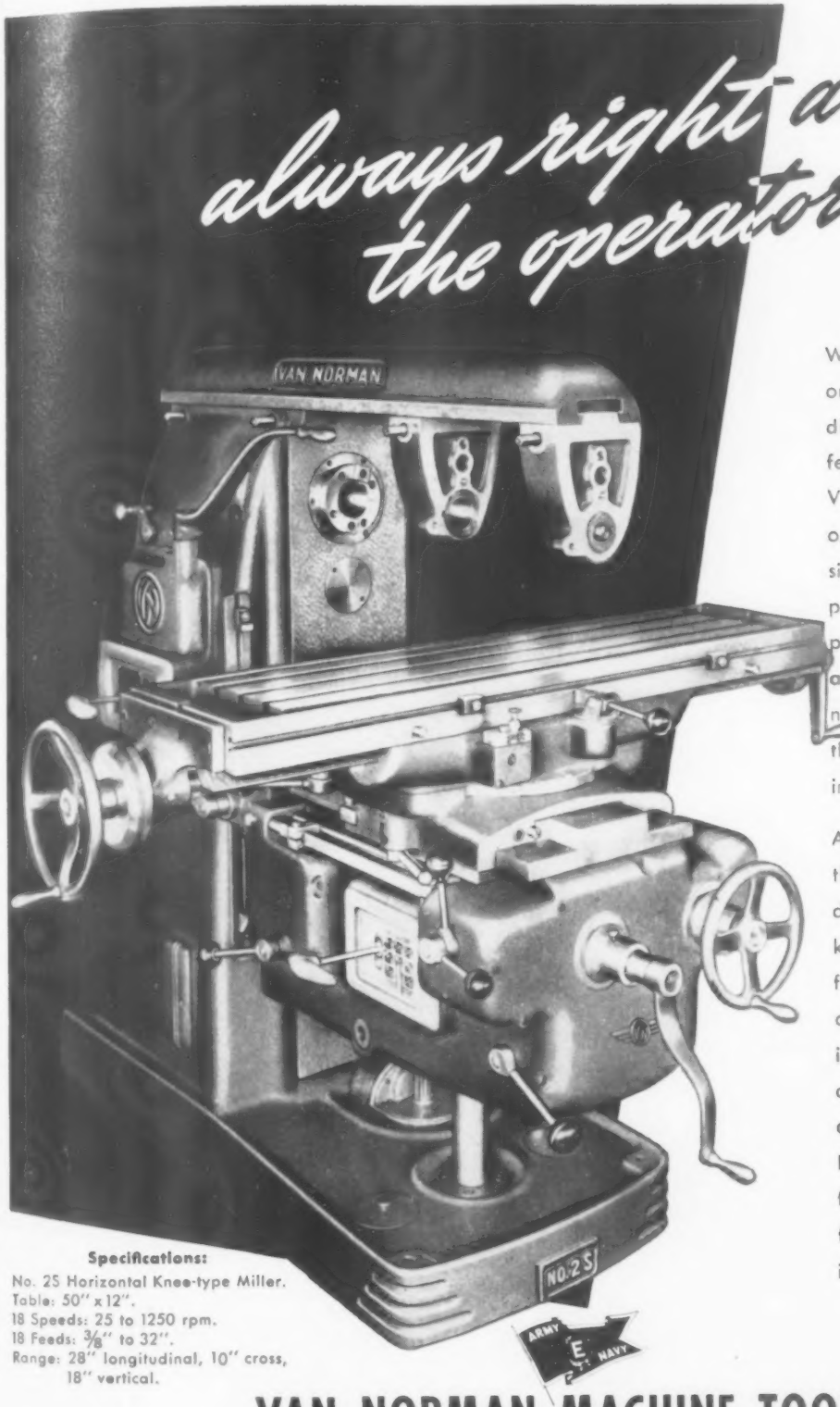
ARMY NAVY

PNEUMATIC THE ARO EQUIP. CORP. ARO TOOLS BRYAN, OHIO

The Aro Equipment Corp.
Bryan, Ohio

VAN NORMAN operating controls are

always right at the operator's hands



Specifications:
No. 2S Horizontal Knee-type Miller.
Table: 50" x 12".
18 Speeds: 25 to 1250 rpm.
18 Feeds: 3/8" to 32".
Range: 28" longitudinal, 10" cross, 18" vertical.

Whether the operator is at the front or rear of a Van Norman Miller, the directional controls for all power feeds are always right at hand. This Van Norman feature enables the operator to do more accurate work since he can position himself at the point where he can best watch the progress of the cut. In addition, front and rear directional controls eliminate unnecessary operator movement thus reducing worker fatigue thereby increasing production and accuracy.

Add to this, the directional control of the feed levers which operate in the direction of desired table, saddle and knee movement... the single lever feed selector that provides 18 changes of speeds... the conveniently located spindle clutch lever, adjustable to the most convenient operating position... and other Van Norman design and construction features... all combined to provide faster, accurate and economical milling with both new and old operators.

VAN NORMAN MACHINE TOOL CO.

SPRINGFIELD, MASSACHUSETTS

"It pays to Van Normanize"

Announcing

The New 277

Safety Grinding Wheel

for

Centerless and Cylindrical Jobs,

especially adapted

for

National Emergency Steels

The new bond used in No. 277 wheel is the product of Safety's Engineering Research staff. This new bond is one of our staff's outstanding contributions to the war effort.

The new No. 277 wheel is available in practically any size, shape, grit, porosity and grade of hardness. We will be pleased to quote on your requirements. Write us today.

THE SAFETY GRINDING WHEEL AND MACHINE COMPANY

SPRINGFIELD, OHIO — SALES OFFICES IN PRINCIPAL CITIES — ESTABLISHED IN 1892

MANUFACTURERS OF SAFETY MOTOR DRIVEN PORTABLE GRINDERS, SAFETY RITE-SPEED GRINDERS, GRINDING WHEELS FOR EVERY PURPOSE, INCLUDING THE FAMOUS "SAFETY GRIP-LOK GRINDING WHEELS"

Citation of Honor

ON THE PRODUCTION FRONT

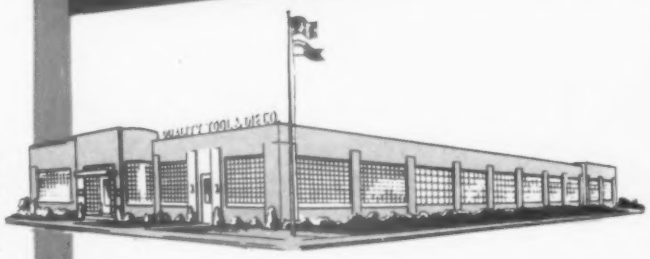
The men and women of the Quality Tool & Die Company, of Indianapolis, have received the coveted Army-Navy "E" Award in recognition of outstanding accomplishments in the production of precision inspection gages.

We are indeed proud of this, the highest honor which can be paid to civilians for their contribution to Victory. The "E" pins, which we wear, will serve as an inspiration to even greater achievements in the days ahead.

I wish to take this opportunity to publicly express my deep appreciation to all the loyal workers whose devotion to duty and constant striving for improvement has brought this award to the Quality Tool & Die Company.

Ray H. Rice.
General Manager

Quality
TOOL & DIE CO.
Manufacturers of "Quality Products"
INDIANAPOLIS, INDIANA



Yesterday—*Only true pioneers and thrill seekers would ride in the rickety "egg crate" plane. Yet that plane, with all its crudities, was a giant step in human progress and transportation. Without early abrading, processes such as grinding, it would have been impossible.*

Today—The giant air liner is a tremendous improvement on the plane of yesterday—as is the modern fighter or bomber over the planes of World War I. HONING—the advanced abrading process—helped to make this improvement possible. Safety, lightness, long operation without overhaul—all are dependent to some degree on HONING.

Tomorrow—We do not know what course the progress of air transport will take. But whatever it is, there will be greater need for better controlled machining processes.

Micromatic has developed the HONE ABRADING process to be ready for these advanced requirements. At present, HONING application is limited to serious war needs. Tomorrow, it can expand with many new applications already developed.

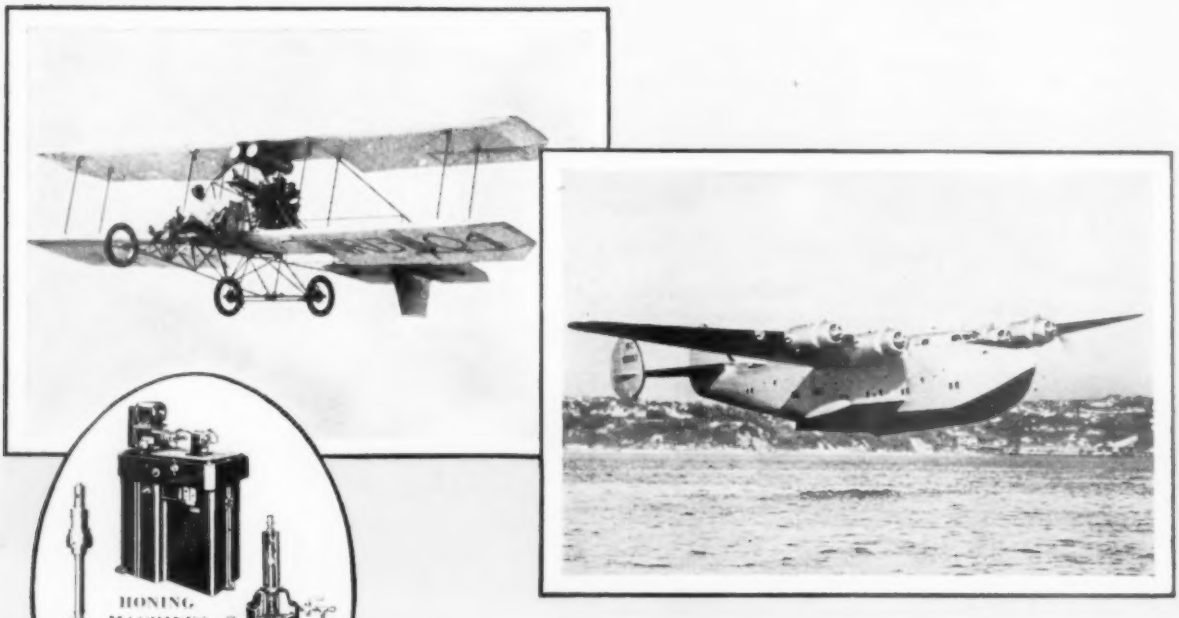
HONING

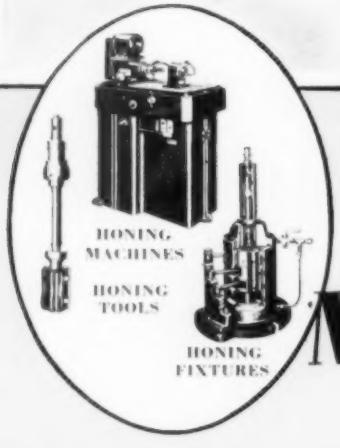
helped to develop yesterday's

"EGG CRATE" Plane

into the

SAFE, MODERN AIR TRANSPORT



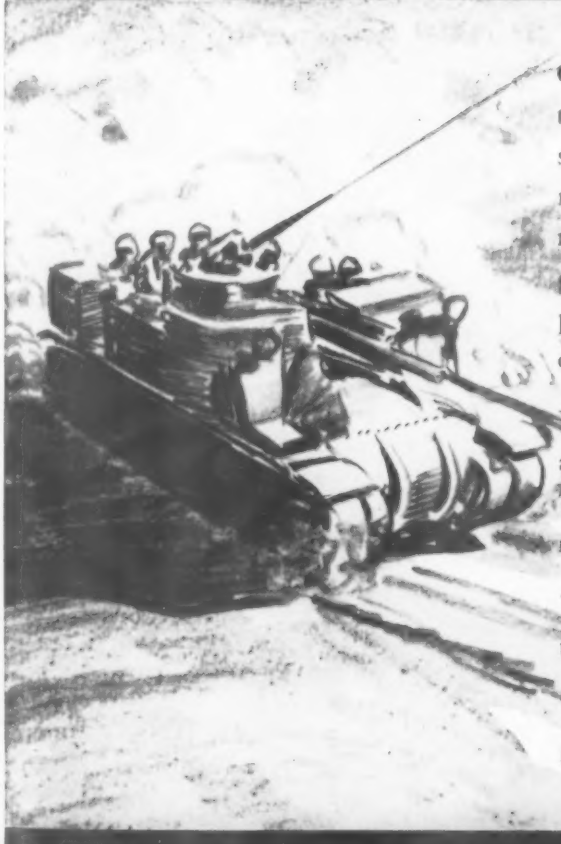


Micromatic HONE CORPORATION

Detroit, Michigan

MAKERS OF HONING MACHINE TOOLS

....finer and faster!



Geared to high speed and fast action, America's new tank-busters rip into the enemy's crack tank columns, smashing their most powerful tanks and putting them to rout. Not once, but many times during the past few months has this happened. These tank-busters depend greatly upon accurately made gears for their speed and performance. Such gears can be accurate only when checked against precision-built master gears.

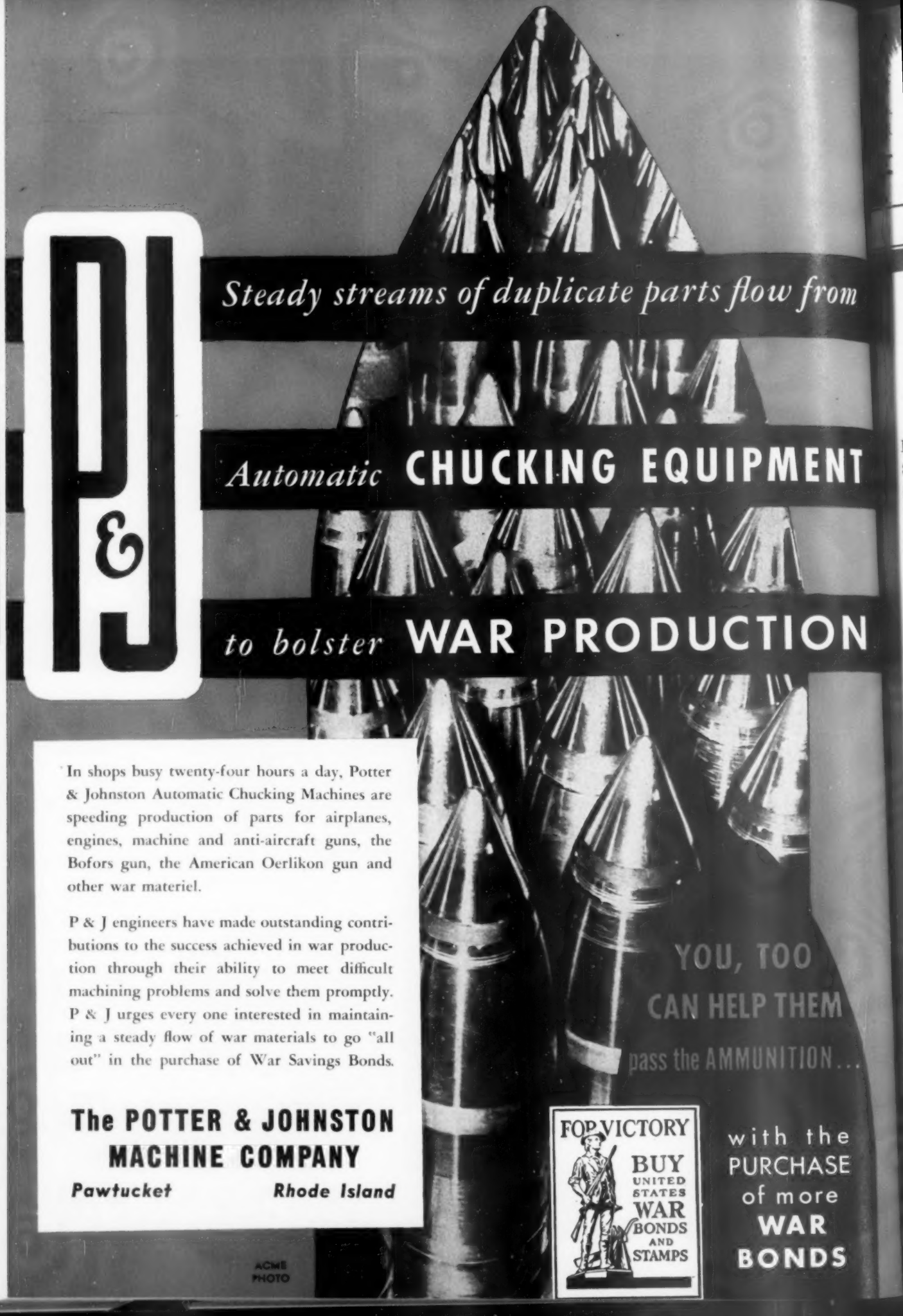
VINCO Master Gears are carefully controlled through all stages of manufacture from design to final inspection. They represent the ultimate in the art of precision manufacture of spur, helical and worm gears.

VINCO's long experience in precision is at your service in the solution of your war or post-war production problems.

VINCO CORPORATION

8857 SCHAEFER HIGHWAY • DETROIT 27, MICHIGAN, U. S. A.

MILLIONTHS OF AN INCH FOR SALE BY VINCO


P & J
Steady streams of duplicate parts flow from
Automatic CHUCKING EQUIPMENT
to bolster WAR PRODUCTION
In shops busy twenty-four hours a day, Potter & Johnston Automatic Chucking Machines are speeding production of parts for airplanes, engines, machine and anti-aircraft guns, the Bofors gun, the American Oerlikon gun and other war materiel.
P & J engineers have made outstanding contributions to the success achieved in war production through their ability to meet difficult machining problems and solve them promptly. P & J urges every one interested in maintaining a steady flow of war materials to go "all out" in the purchase of War Savings Bonds.
The POTTER & JOHNSTON MACHINE COMPANY
Pawtucket Rhode Island
ACME PHOTO
YOU, TOO CAN HELP THEM
pass the AMMUNITION...
FOR VICTORY
BUY UNITED STATES WAR BONDS AND STAMPS
with the PURCHASE of more WAR BONDS

Cutting oil *News* letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs.

AUGUST, 1943

Wisconsin shop, working beads on 20 mm. casings, lengthens tool life 80%

IN TURNING the beads on 20 mm. steel cartridge casings (1025 steel, 80 Rockwell hardness) using high speed moly tools, a Wisconsin shop found that the finish secured with soluble oil was not up to par and tool life was too short. Use of Thio Cutting Oil gave a swell finish, virtually eliminated rejects, increased tool life 80%.

How electrolysis was licked. In their efforts to keep going full tilt many shops bump into new and unexpected maintenance problems. A wire manufacturer in Indiana, for example, found that in using a high grade cup grease for bearing lubrication, some electrolytic action was encountered. This action was probably abetted by the small water content of that type of lubricant. A change to Stanodrip No. 229 solved this problem.

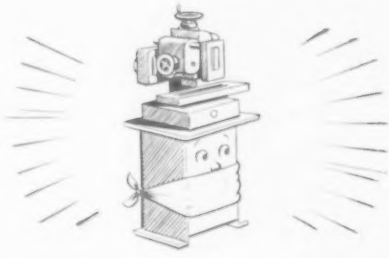
Can bolt threads be beautiful? Yes, say operators of an Illinois machine shop. Since they started using Acme Cutting Oil No. 110 on their bolt threading machines, the work is turned out faster, with better die life and a much cleaner thread finish.

Perhaps he has answers to your questions

Remember that a Standard cutting oil specialist has detailed information on many cutting problems, both from his own field experience and from data relayed to him by the Standard Oil Technical Department. He has, or can probably get, the answers to any cutting oil or coolant problem you are facing in your shop. For the name of the nearest Engineer, contact any Standard Oil Company (Indiana) office, or 910 S. Michigan Ave., Chicago, Ill. In Nebraska, address any Standard Oil Company of Nebraska office.

News of a cold nosing compound. We might as well tell you right off the bat this is no dog story. It's about a shop in Kansas City that was using ordinary cold nosing compound cut back with engine oil for work on 75 mm. projectiles. And it gave them these two operating headaches: 1. Difficulty in getting proper consistency; 2. Drawing ability wasn't what it should be. Now they use a Standard Oil lubricant especially adaptable for the service and "everything is jake," say the operators.

Batch filtering stops thread burning. A Ft. Wayne shop reports that batch filtering of thread grinding oil on Excello grinders every 4 or 5 days did away with bothersome smoking and burning of the threads in grinding a special type of stainless steel.



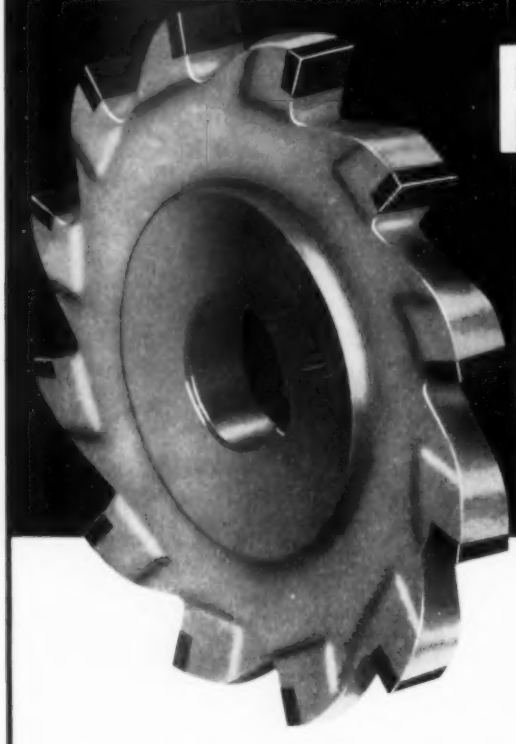
Suggestion for stopping tool chatter. It seems that a new "film" star has come to light. A Minneapolis shop found the answer to the tough problem of maintaining a film on ways and guides of machine tools with Stanolex No. 31. According to the report, this Stanolex film ended chatter and vibration of the carriage, and resulted in better finish on the work, even when under heavy loads using soluble oil as the cutting medium.

How stainless steel bushings were kept from turning blue. An automotive plant up in Michigan formerly used soluble oil for turning main and "con" rod bearings of truck engine crank shafts. Anxious to step up its production and better the tool life, this shop made some tests with Stanicut 107 BC. Applied in larger quantities than the soluble oil, the Stanicut cooled the work, and also made the tools last longer.... Then, the same oil was used successfully for turning, reaming and drilling thin-walled stainless steel bushings, which formerly tended to turn blue.

OIL IS AMMUNITION...USE IT WISELY

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICAT



PRODUCTION UP 300%

★

New

Carbide Tipped Cutter by SUPER Establishes *New Records of Speed and Economy!*

It's true! Wherever you find these new high efficiency carbide tipped milling cutters by Super Tool Company at work, you'll find production men talking of speedier production. Here's an example:

One plant where aircraft landing gear parts are milled reports a production increase of 300%. On this job a 6" diameter cutter cuts a slot ¾" wide and 2½" deep from the solid in 3140 steel at a rate of feed 600% heavier than with regular high speed steel cutters. On other production jobs these new cutters are used in steel at surface speeds of 400 to 800 feet per minute with tooth loads varying with the hardness of the steel from .0005" to .0025". That means table feeds of 5" to 18" per minute!

And these same production men talk of other advantages, too! They speak of greater accuracy because faster operating speeds mean less cutting pressure with less distortion of work. They speak of finer finishes. And they speak of economy not only in terms of more work, better work, faster work and lower initial cost but because these new cutters are designed to be used for slotting, side milling, face milling or half side milling without alteration.

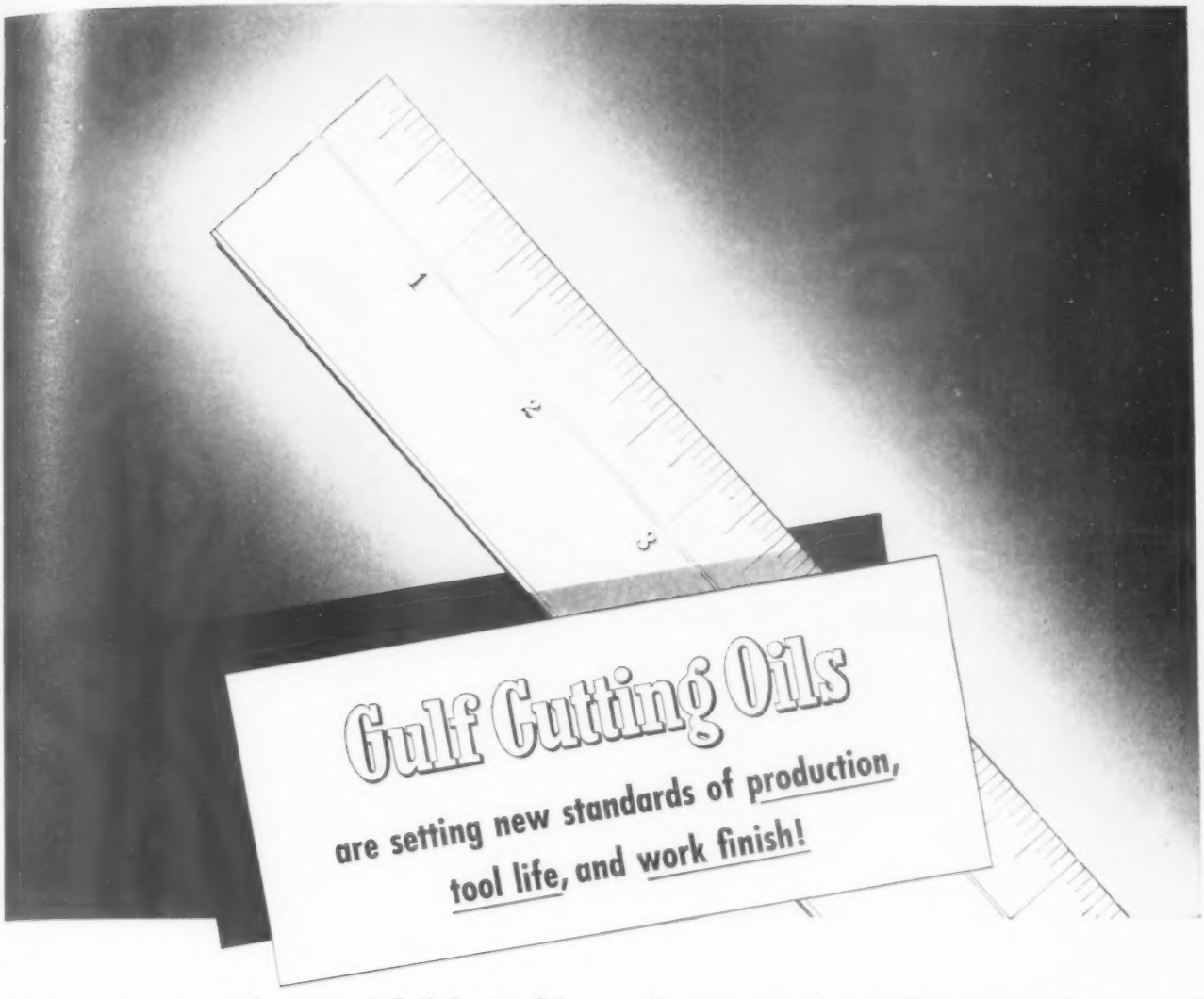
Why not learn of the many other advantages of these revolutionary new carbide tipped cutters by Super that are available for cast iron and non-ferrous materials as well as for steel! May we send you a descriptive folder giving prices and full details?

Most Sizes Available for Immediate Shipment NOW . . . others in two or three weeks

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California



Let proven superior performance of Gulf Cutting Oils in over 1,000 war production plants be your guide to improved machining practice — call in a Gulf Lubrication Service Engineer for a conclusive shop demonstration.

Experience with Gulf Cutting Oils in over 1,000 war production plants brings this fact into sharp relief: A new yardstick is needed to estimate machine tool performance when the proper Gulf Cutting Oil is selected for a particular job!

In plant after plant, Gulf Cutting Oils have set new standards for production, tool life, and work finish—up to 400% increase in production per machine, up to 2,000% longer tool life, and extremely interesting improvements in finishes.

It will pay you to investigate these superior cutting oils—call in a Gulf Lubrication Service Engineer now and let him demonstrate their unique properties, which have proven so outstandingly successful for machining all types of metal parts. He can help you improve *your* machining practice.

GULF OIL CORPORATION · GULF REFINING COMPANY
GULF BUILDING, PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

Mail this coupon today!

Gulf Oil Corporation · Gulf Refining Company TE
3800 Gulf Building, Pittsburgh, Pa.

Please send me, without obligation, a copy of the new revised booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

Name .....

Company .....

Title .....

Address .....

DIES ARE INVESTMENTS

Moore Jig-Grinding of Holes Produces Dies of Longer Life at Less Cost

A jig-ground die is always the best investment! Experience has shown that grinding after hardening *increases* die life and *eliminates* die failures, thus lowering die costs.

Grinding holes, both straight and tapered, to size and location with the Moore Jig Grinder results in greater accuracy and more uniform clearance between punch and die...the finish is smoother and the decarbonized surface of the steel is removed.

In addition, the Jig Grinder, a new-type machine created specifically by Moore tool-and-die specialists to solve the bugaboo of hardening distortion, will do the work in one-third the time required by previous costly, highly skilled and, at best, makeshift methods. Without a Moore Jig Grinder, the holes in a multiple-station die would have to be ground one section at a time and then each section accurately assembled in the die bed.

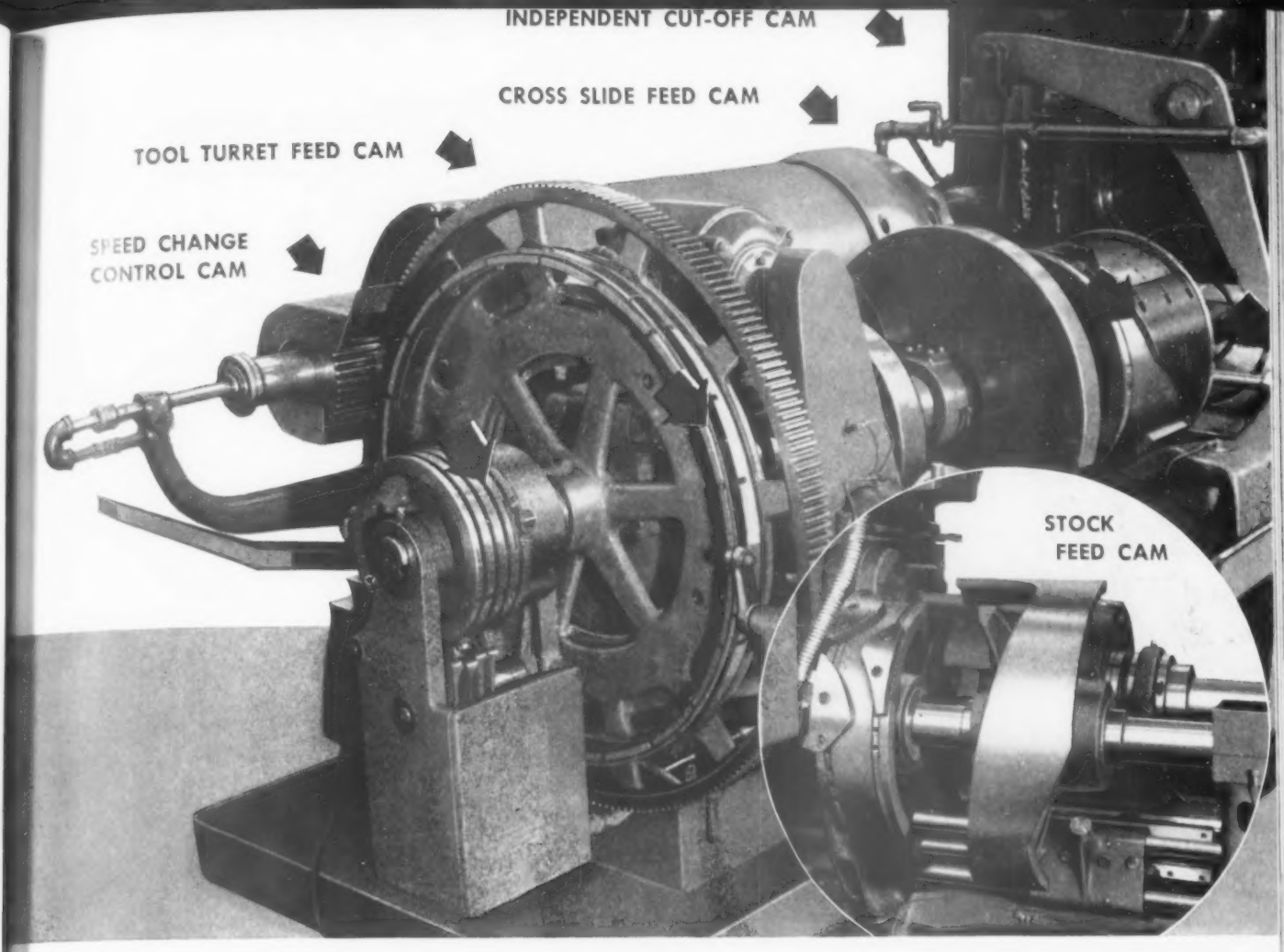
With a Moore Jig Grinder, all the sections can be screwed and doweled into place, put on the machine and ground in one setting, depending *entirely* on the Jig Grinder for location. This eliminates hours of checking and measuring on the bench and surface plate, where the die-maker, under the best of conditions, cannot possibly work as closely as the Jig Grinder.

PARTNERS IN PRODUCTION • Moore Jig Borer bores the holes in the die sections before hardening, thus holding the location as close as possible to eliminate excessive grinding. Send for literature on how both machines will modernize your toolroom operations.

MOORE TOOLS

MOORE SPECIAL TOOL CO., INC · BRIDGEPORT, CONN.

MOORE JIG BORERS AND JIG GRINDERS · PARTNERS IN PRODUCTION



CLEVELAND UNIVERSAL CAMMING HELPS IN SOLVING YOUR MAN-POWER PROBLEM

MODERN production, be it on munitions or "civilian goods", constantly faces the need to make time savings on each operation on every machined part, to give each man *the power to produce more,* both for the assembly line and for himself. Clevelands help to solve such problems, not merely because they are fully automatic, but also because of exclusive Cleveland production speeding features. A good example is universal camming, which greatly reduces the time required for set-ups and adjustments.

Every operation on a Cleveland Single Spindle Automatic is controlled by standard cams. Quick settings are made possible by this Cleveland feature, and when a set-up is made, the Cleveland speed of production on multiple operations is such that savings commence within a very few pieces after the run starts. That's another reason why Clevelands have a wide reputation for . . .

1. Maximum sustained production on long runs, with minimum down time for adjustments.
2. Profitable economy on small lot, short run jobs.

Just Remember, Clevelands Cut Costs

THE CLEVELAND AUTOMATIC MACHINE COMPANY
CLEVELAND, OHIO

CHICAGO: 20 North Wacker Drive, Civic Opera Building, Room 1408
DETROIT: 540 New Center Bldg. CINCINNATI: 1315 American Bldg.
NEWARK: 902 American Insurance Bldg.

CLEVELAND
Single Spindle
AUTOMATICS

MODEL A—Built in 1⅛-inch to 9½-inch capacities
MODEL B—Built in 1⅛-inch to 2½-inch capacities

Each twist of the wrist bites off a burr

Here you see one of the new Severance family of remarkably useful deburring tools. With a twist of the wrist this Severance Hand Radius Deburring Cutter easily bites off the burr or sharp edge left by a drill or punch. It does not countersink the hole. Available in a wide range of sizes with radius or ball nose. Special shapes, to solve your individual problem, are available upon request.

For prices and complete information about these money-saving, time-saving tools write to Severance Tool Industries, Inc., Saginaw, Michigan.

Severance

SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN.
PLANTS IN LONG ISLAND CITY, NEW YORK; CHICAGO; DETROIT; FORT WAYNE, INDIANA; LOS ANGELES

You get accurate, dependable results and SAVE A LOT OF MONEY—with the Delta Carbide Tool Grinder

This low-cost grinder runs absolutely true, free from vibration — for delicate grinding of carbide tipped tools.

Manufactured by modern precision methods in a modern plant, this sturdy, vibrationless Delta Carbide Tool Grinder is so well-built, so accurately machined that you can depend on especially fine results.

It is so low in cost that it can be used profitably in *any* shop — large or small. Combined with the Delta standard tool grinder for hogging down the shank steel, it gives you a perfect working combination for sharpening tungsten carbide tools, with a remarkably small initial investment.

Many outstanding features to assure accuracy and long life

The motor, contained in the head, is of the reversible type with convenient built-in reversing switch; it is equipped with self-sealed ball bearings which require no lubrication for their entire life. Manually-operated brakes on each wheel permit the grinders to be slowed down and stopped immediately for reversing.

One 60-grit and one 120-grit wheel mounted directly on motor shaft; surface speed 5200 feet per minute. Grinder also takes standard diamond wheels; has convenient water pot for bringing water to the grinding surface. Heavy, accurately ground tables with 75° tilting range. Entire sub-base quickly, easily removed for cleaning out rusty sludge. Handy, adjustable light.

Widely used in war plants

This good-looking, modern machine has made a record for itself wherever it has been installed. Get credit for discovering the low-cost Delta way in *your* plant. Investigate! Send for the new Delta catalog giving full details. M-2

TEAR OUT AND MAIL THIS COUPON TODAY

THE DELTA MANUFACTURING COMPANY
610H E. Vienna Ave., Milwaukee 1, Wis.

Please send me your new catalog giving full details on the Delta Carbide Tool Grinder and your full line of low-cost machine tools.

Name..... Position.....

Company.....

Address.....

City..... (.....) State.....
Zone

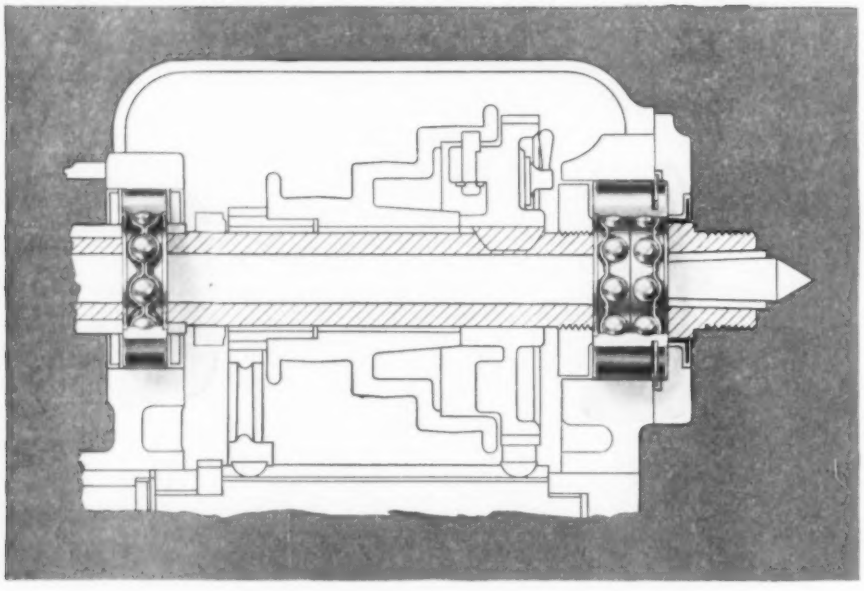
Reversing Switch

Conveniently located at front of grinder. Six-pole type, completely wired into the unit. Opens both sides of line.

THE ARMY-NAVY "E"
—awarded for excellence in the production of machine tools vitally needed in the war effort.

SUSTAINED *Spindle Accuracy!*

☆ A FINER FEATURE OF LOGAN LATHES



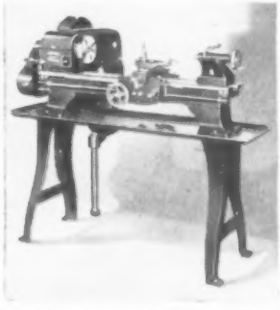
Brief SPECIFICATIONS

- Swing over bed 10½"
- Bed length 43⅛"
- Spindle hole 25/32"
- Precision ground ways: 2 prismatic "V" ways; 2 flat ways
- 12 spindle speeds—30 to 1450 per minute

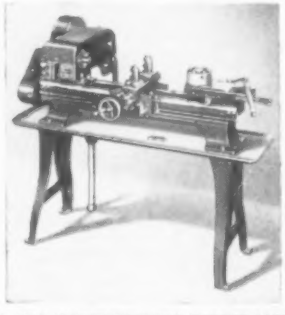
Precision, Pre-Loaded Ball Bearing Headstock is Standard Equipment on All Models

Your purchase of a lathe is an investment. To be profitable, it should be a ***long term*** investment in speedy, accurate production. It will be if the lathe is a Logan, because Logan engineering designed it that way... throughout! For example, to assure sustained accuracy of the spindle, the headstock is equipped with special New Departure Ball Bearings. These bearings, of extreme precision, are pre-loaded so that the pressure of the cutting tool... either radial or thrust... causes a minimum deflection of the spindle. In addition to "pre-loading"... these ball bearings are grease sealed... requiring no lubrication and no adjustment for their entire life. Moreover, the higher operating speed of the Logan Lathe, due to its ball bearing spindle mounting, enables a shop to take every advantage of modern, high speed cutting methods. Production is increased and unit costs reduced.

Write for catalog sheets so that you can compare before you buy.



NO. 200 BACK GEARED SCREW CUTTING LATHE



NO. 850 MANUFACTURING TURRET LATHE

NO. 830 ⅝" CAPACITY HAND SCREW MACHINE

LOGAN ENGINEERING COMPANY
CHICAGO, ILLINOIS

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

More grinding machine failures are due to inadequate lubrication than most operators realize. A study of chapter eight in the book "Better Grinding" will help prevent this. The mailing of the coupon below will bring you a copy. It is easy to read and complete, as it includes seventeen other chapters on the art of precision grinding.

THE LANDIS 10" TYPE DC PLAIN HYDRAULIC GRINDERS

• Are recommended for general spindle and shaft work, crankshaft line bearings, multiple wheel and form wheel grinding. They are used by many war industries for assorted crankshaft operations.

IF YOU HAVE A GRINDING PROBLEM

Let George do it

George Grindit Says

"Deprive moving parts of a film of oil and they often screech in protest. Then they give up the ghost. Precious hours and material are lost. Oil right and your grinder will be 'oilright'."

THE CHAPTERS

Work Centers and Centers in the Work . . Work Drivers and Driving Dogs . . Work Rests . . The Diamond . . Wheel Dressing and Wheel Truing . . Mounting and Balancing the Wheel . . Grinding Wheel Coolant . . Lubrication . . Multiple V Belt Drives . . Wheel Spindles and Bearings . . Grinding Wheel Feed . . Grinding Wheel Width . . Speed of Work Carriage Traversal . . Work Speed . . Grinding Wheel Speed . . The Grinding Wheel . . Chatter . . Miscellaneous Bits.

Please Send Me a Free Copy of . . .

"BETTER GRINDING"

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CITY _____ STATE _____ 8-S

Please Print Above and Send To

LANDIS TOOL CO.

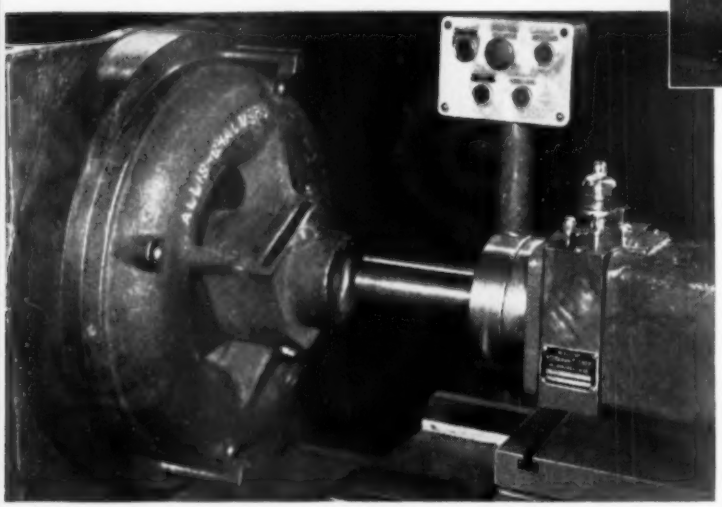
WAYNESBORO
PENNSYLVANIA

Motor End Shield Bearing Seats Precision Bored on

STOKERUNIT SIMPLEX *Precision* BORING MACHINE

The two bearing seats in this electric motor end shield are precision bored in one operation.

No. 2U Stokerunit Simplex Unit-Type Precision Boring Machines are adaptable to a wide range of work.



Motor end shield is accurately located on this face plate type fixture.

Profit with Stokerunit Versatility...

Over 25 versatile models of Stokerunit Simplex Precision Boring Machines are available to solve *your* precision boring problems. They cover practically the entire range of precision boring applications and can be furnished in mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work.

For specific recommendations, send blueprints of parts with production requirements. No obligation.

Write Today for these two booklets covering details of our entire line of Simplex Precision Boring Machines.

Finish Boring Time 2 Minutes for Both Seats . . . Total Boring Length—2¾″

The two bearing seats in the end shield of this electric motor are precision bored on a No. 2U Stokerunit Simplex Single-Spindle Precision Boring Machine. Both are identical in diameter—3.6875″. Length of bore on first seat is 1½″, on the second 1¼″. As they are spaced 4⅛″ apart, a total spindle travel of more than 6⅞″ is necessary to complete the boring operation.

The total boring time of only 2 minutes for both bearing seats is made possible by rapid traverse of the Stokerunit Simplex spindle unit, which automatically provides quick approach to cutting position at each seat and quick return at end of machining cycle.

Additional Boring Data: Spindle speed 400 r.p.m.; feed 1⅜″ per min. Tolerance on finish bore is −.001″; high finish is produced. Material is cast iron. Tungsten carbide cutters are used.

The face plate type locating fixture has multiple locating rabbets for holding various sizes of end shields. This fixture is also equipped with an adapter for holding various sizes of ball bearing cages up to 6″ in diameter while boring the ball bearing seats.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

4528 WEST MITCHELL STREET • MILWAUKEE 14, WISCONSIN

In a recent letter from a lad at Guadalcanal to his former employer was voiced the greatest challenge of our time.

"What," he said, "am I, and all these fellows with me, going to do when this thing is over?" Is peace to bring with it the deadly spiral: men laid off and demobilized, hence less purchasing power, hence more plants closed down, hence more men laid off, hence — ?

We believe we've seen the answer right on the production lines and right in the post-war plans of American industry.

We've seen and consulted with hundreds of research men uncovering new secrets in metallurgy, synthetics, plastics, aeronautics — finding new techniques and economies — planning new and wonderful products that will cushion the post-war interim to the greatest production age in history.

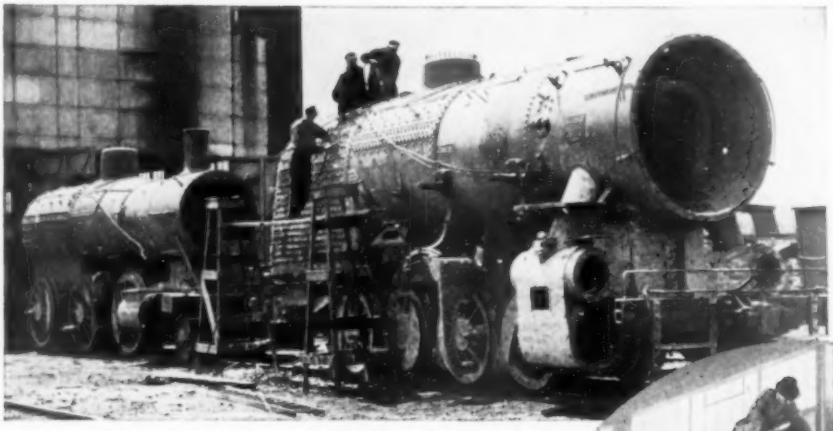
As internal grinding specialists, we at Bryant have already helped to solve production problems involving the machining of many new light metals, alloys, and synthetic materials including glass, plastics, hard rubber, wood, graphite, and even machine parts made of paper.

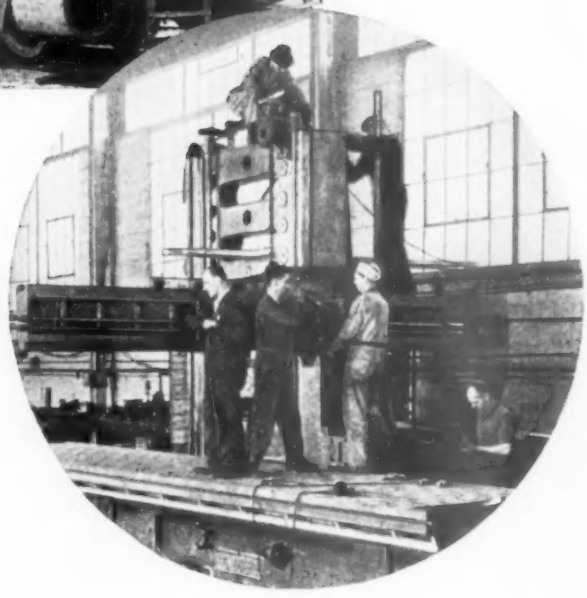
We've developed many new techniques in tooling, and we believe that this knowledge is important to your future. For that reason, our Consulting Service is available at all times. Call upon us now!

SEND FOR THE MAN FROM BRYANT...

Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.





CAN IT RUN? then get it running!

Fifty-eight discarded engines that could! The New Haven Railroad has rebuilt and restored to service that many graveyard-bound locomotives. To meet the staggering demands of wartime transportation, the railroads are determined that "if it's got wheels, get it rolling!" As you can see, the New Haven is doing just that, reconditioning them from the wheels up. ★ Of vital machine tools, the Simmons slogan is, "If it can run, get it running—and keep it running!" Here at the country's largest rebuilding plant machine tools of all categories and sizes are restored to active service—from large open-side planers (see photograph) and 110″ gun lathes to toolroom millers and screw machines. Railroad shops, shipyards and automotive plants, among others, are using machine tools rebuilt and modernized by Simmons engineers. If you have a metal-working problem, let Simmons take it over. Simmons Machine Tool Corporation, 1810 North Broadway, Albany, N.Y.

SIMMONS ENGINEERED *Machine Tool* REBUILDING

The PRODUCTION *Line is the* LIFELINE *of America!*

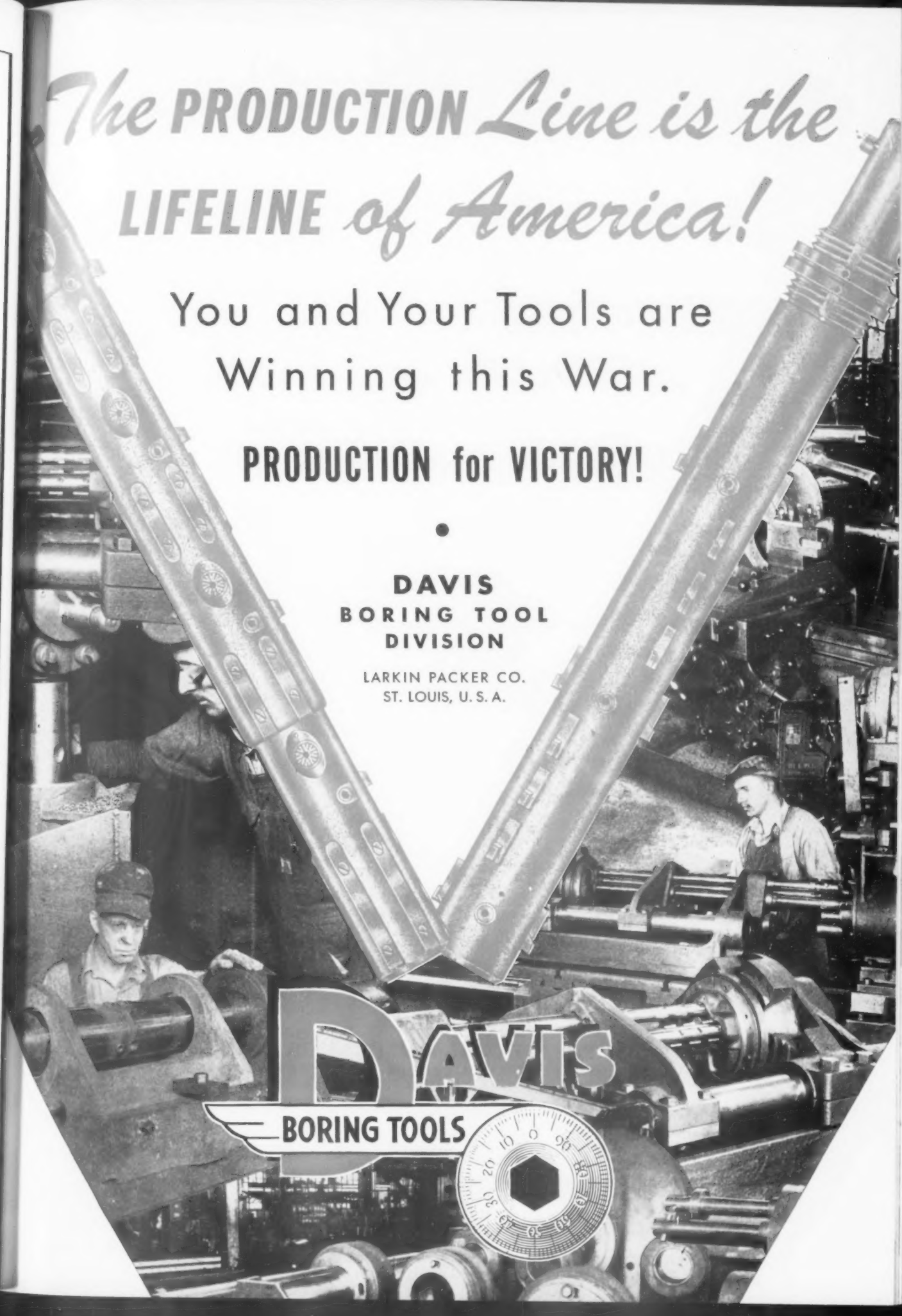
You and Your Tools are Winning this War.

PRODUCTION for VICTORY!

•

DAVIS
BORING TOOL DIVISION

LARKIN PACKER CO.
ST. LOUIS, U. S. A.



EGYPTIAN

Victory "Spec" Finishes

As the world map changes and the black areas happily grow smaller, radical changes occur in war equipment.

Not yet are we ready to beat our swords into ploughshares. But tanks are giving way to locomotives, old contracts for certain parts are not being renewed; we are approaching the saturation point on instruments, small arms and camp equipment. Contracts are being let for needed new and different materials.

As the battle fronts change, so change the production fronts—and the finishing fronts.

New and revised Finish Specifications for wartime equipment will shortly be issued. And as usual EGYPTIAN will be ready to meet them!

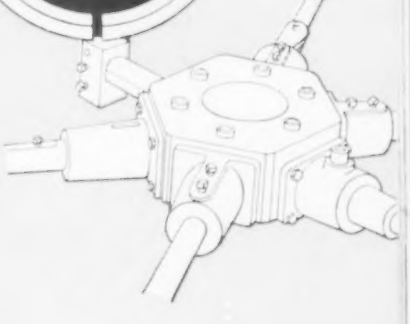
The newly revised 1943 edition of our book "United States Government Specification Finishes" will soon be ready for distribution to those interested in wartime finishes. Reserve your copy today. Please address Dept. TE

THE EGYPTIAN LACQUER MANUFACTURING CO.
ROCKEFELLER CENTER—NEW YORK, 20, N. Y.

EGYPTIAN
Superior FINISHES

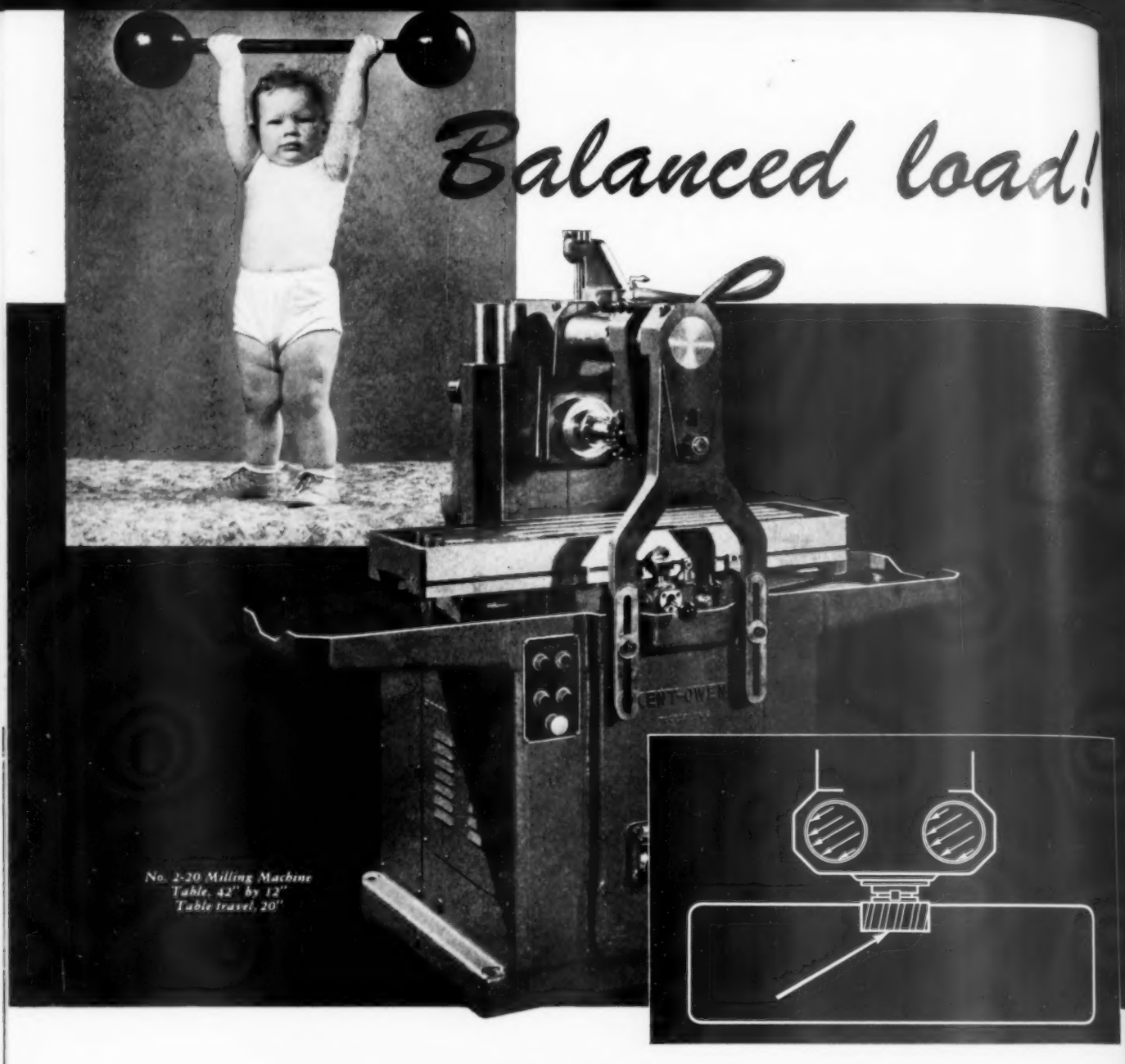
THAT'S NO WAY TO BEAT THE AXIS, SON!

GISHOLT



NEVER CLEAN A MACHINE WITH AN AIR HOSE! Strong blasts of air can blow fine chips and dirt into small clearance openings and bearings where they may lodge and cause serious failures.

★ *Reprints of this page on enameled paper are available for bulletin board use in your turret lathe department. Write the Gisholt Machine Company, 1229 East Washington Avenue, Madison, Wisconsin. Ask for the series of "War-Time Care and Operation Posters."*



THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

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Exclusive TWIN POST MOUNTING

offers BALANCED LOAD IN EITHER DIRECTION

★ In Kent-Owens Milling Machines . . . the head is mounted on two cylindrical ground steel posts which carry the spindle midway between them. There is no overhang and no cocking action. The result is an unusually rigid and accurate machine which is practically chatter-proof for either direction of table travel. Write for latest bulletins. Kent-Owens Machine Company, Toledo, Ohio.

Call on KENT-OWENS *for Milling Machines*

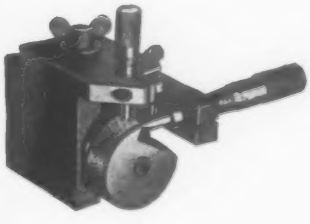
in less time

More and more men who have tight schedules to maintain are using Namco Circular Chaser Die Heads. They will tell you that these tools will turn out more work—per hour or per day. Class 3 threads, too, on a production basis.

Chasers are reground on blocks. Inserting a duplicate set in head is a two-minute job, and you are ready to cut identical threads, without "trying for size" and without work spoilage.

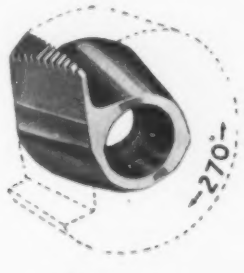
In the same rigid head, circular thread chasers may be interchanged with hollow milling cutters and blocks.

Capacities: .056″ to 4⅞″—revolving or stationary type. Send for Catalog D-42.



Namco Micrometer Gauge

determines correct amount of metal to remove for Circular Chaser grind, and double-checks precision after grinding.



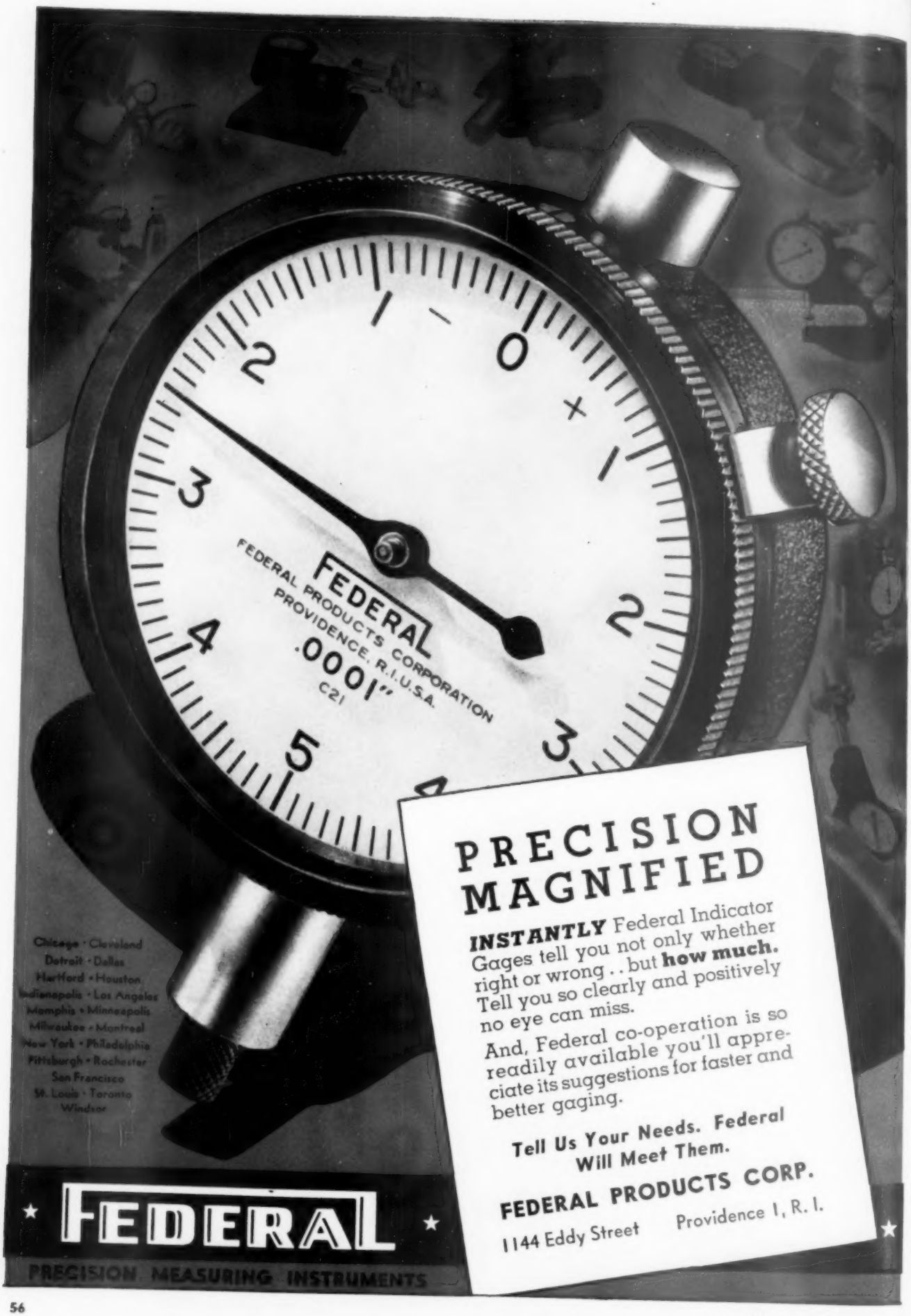
Namco Circular Chasers

may be ground through 270° of circumference. They last 10 to 30 times longer, with no loss of precision.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING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INSTANTLY Federal Indicator Gages tell you not only whether right or wrong . . but how much. Tell you so clearly and positively no eye can miss.
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PRECISION MEASURING INSTRUMENTS

NICKEL AIDS THE FARM IMPLEMENT INDUSTRY

to KEEP 'EM SERVING!

America won a victory on the food front in 1942 with production that reached an all-time high. But even that wasn't enough to feed a hungry, war-torn world. So this year's objectives are higher.

Farmers need mechanical equipment to produce food in winning quantities. Now, with the critical shortage of skilled farm labor, modern machinery becomes vitally important.

Agricultural equipment engineers have steadily improved farm machinery, lowered costs, and educated users. Result: no nation's farms were ever so fully mechanized as ours. And repair and service facilities have kept pace so farm equipment keeps working without excessive breakdowns or delays.

The foresight of these engineers is shown by their repeated specification of materials strengthened and toughened with Nickel. Their experience proves that a little Nickel goes a long way in the manufacture of parts that stay on the job . . . stressed parts that stand shock overloads.

From tractor transmissions to plow discs, from cylinder liners to bull gears, Nickel teams up with other metals to assure the dependable performance of farm implement parts.

For years, the technical staff of International Nickel has been privileged to cooperate with the engineers and production men who are responsible for such great achievement in the improvement of farm equipment . . . equipment now working at top speed to feed the United Nations. INCO's staff of engineers and metallurgists offers counsel and data to all who seek assistance in the selection, fabrication and heat treatment of ferrous and non-ferrous metals.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects — from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

* *Nickel* *

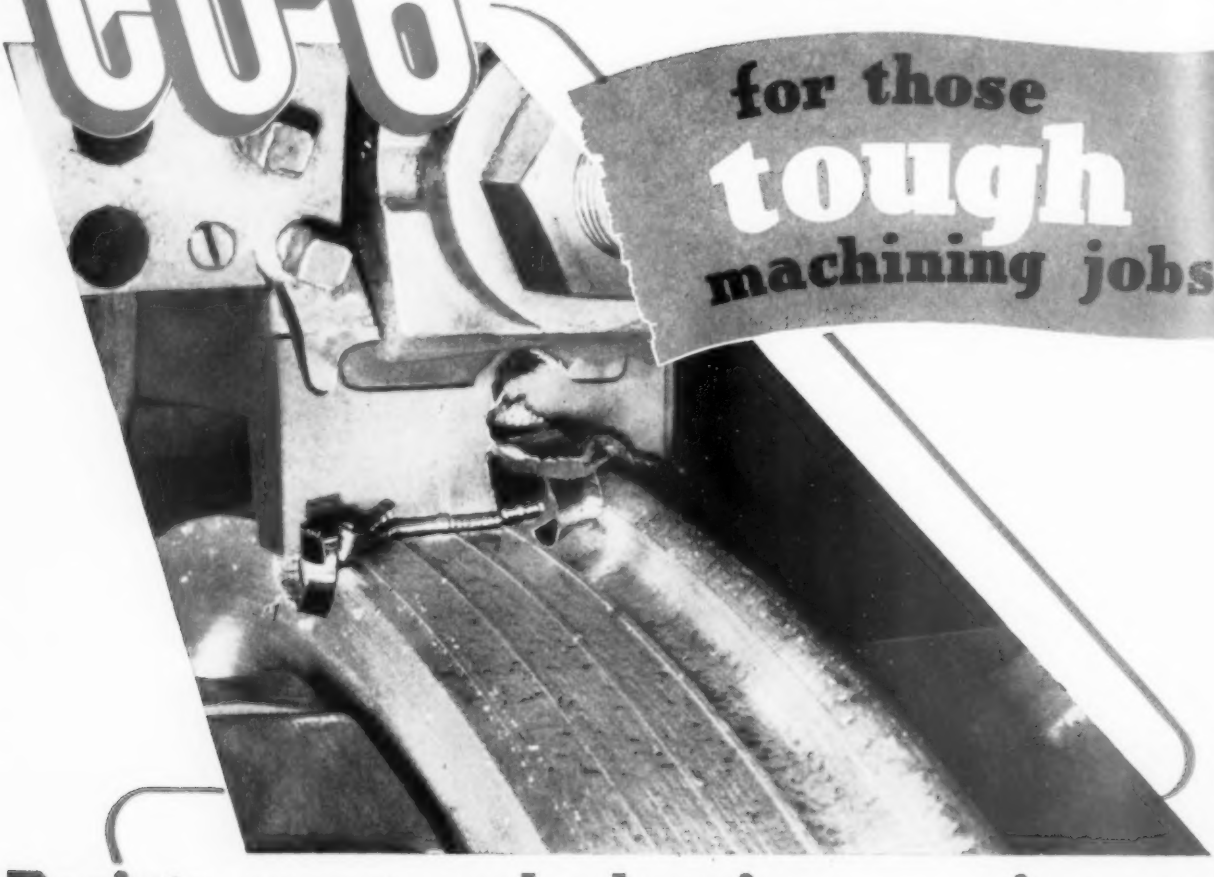
THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

CO-6

TYPICAL ANALYSIS

C	W	Cr	Va	Mo	Co
88%	5.50%	4.00%	1.75%	4.50%	9%

for those tough machining jobs



Resists wear and abrasion . . . increases efficiency . . . assures maximum production

EASY TO HEAT-TREAT

Preheat at about 1450°F;

Harden at 2220° to 2260°F;

Quench in oil or air.

Double-draw at 1050°.

In every plant there is a tough machining job where Tungsten Cobalt High Speed Steels were formerly used. Nowadays, however, they are rapidly being replaced by the Tungsten-Molybdenum-Cobalt type, such as Latrobe's CO-6, with excellent results.

You'll find that CO-6 equals, and in many cases exceeds, the performance of the 9% Cobalt Tungsten types. CO-6 is ideal for machining armor-plate, lathe beds, tank-rings, bearing races, car wheels, locomotive tires and other heavy-duty cutting applications where hardened or semi-hardened parts are involved. In ordering, unlike the Tungsten types, CO-6 need not be balanced with any other steel.

Heat-treating is simple. There is no danger of decarburization in hardening. CO-6 will prove tougher for many uses and provide cutting edges without any tendency to flake.

Our metallurgical staff will be glad to advise on the adaptability of CO-6, described in our new technical bulletin. Write for your copy.

TOOL STEELS FOR VICTORY

LATROBE

ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT . . . LATROBE • PA.

HPM

Builds the Only

"SKIN STRETCHER"

with

Two-Way Stretch

and All-Hydraulic

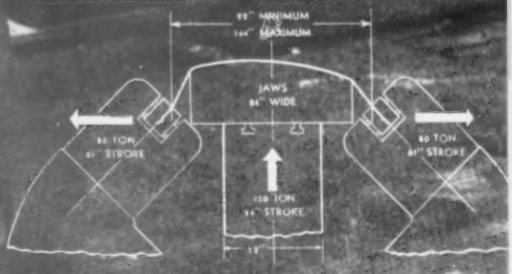
Control

Sheet metal is clamped in positive "non-slip" jaws, and stretched over wood or "Kirksite" dies. Jaws pull sheet as die platen moves upward. This H-P-M Two-way stretch permits the use of intricate dies and insures against "spring back" in the formed part. All press actions, including clamping metal in jaws, are hydraulically controlled. Extruded angles can also be formed with the H-P-M stretching press. Write for complete details.

THE HYDRAULIC PRESS MFG. CO.

Mount Gilead, Ohio, U. S. A.

District Sales Offices: New York, Syracuse, Detroit and Chicago
Representatives in Principal Cities

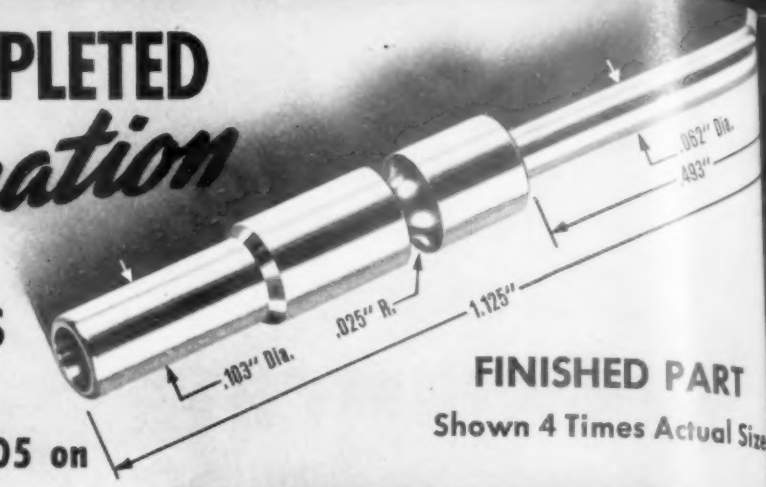


New H-P-M stretching presses have jaw openings on 45° angle. This angle permits shorter blanks and also allows the metal to be gripped in the same plane as the stretch.

This H-P-M metal stretching press is installed in the Wichita plant of Boeing Airplane Company.

THIS PART COMPLETED *in One Operation*

IN LESS THAN 9 SECONDS



FINISHED PART
Shown 4 Times Actual Size

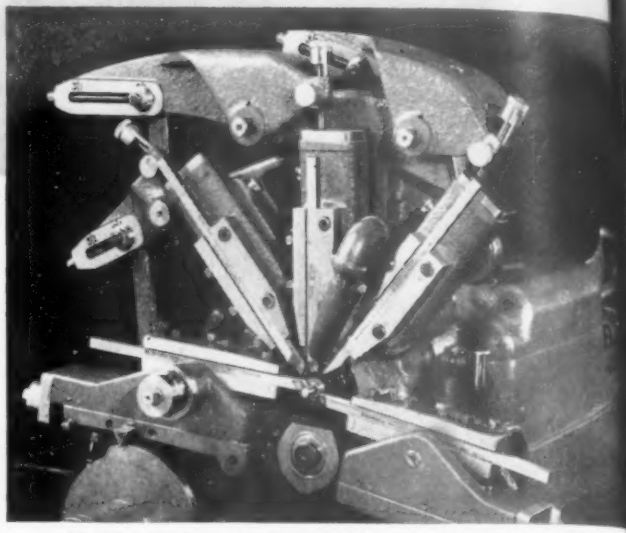
Tolerances Held Within ± .0005 on

GORTON 16-A

Precision AUTOMATIC

The accurate, high speed production of this precision part is simple and highly efficient on the Gorton 16-A. Only this tooling is required: 6 cams, 5 cutting tools, one drill, 2 collets and one bushing. Drilling of hole is accomplished with attachment mounted ahead of cutting tools.

Tolerances on all dimensions are held within ±.0005"; extremely high finish is maintained. Seven pieces are produced per minute with spindle speed of 8700 r.p.m. and surface speed of 290 f.p.m. Material is ⅛" round free-cutting brass.



The 5 actual cutting tools used to produce this job, shown in position on the Gorton 16-A 5-Station Multiple Tool Head.

IN *1* OPERATION
TURNS, CENTERS, DRILLS, THREADS, SLOTS

The Gorton 16-A mass-produces an almost endless variety of short or long slender parts—simple or complex—complete in *one* operation. It does step and contour turning and chamfering in multiple diameters—tapers, knurls, bevels, back recesses, pivot points, etc.

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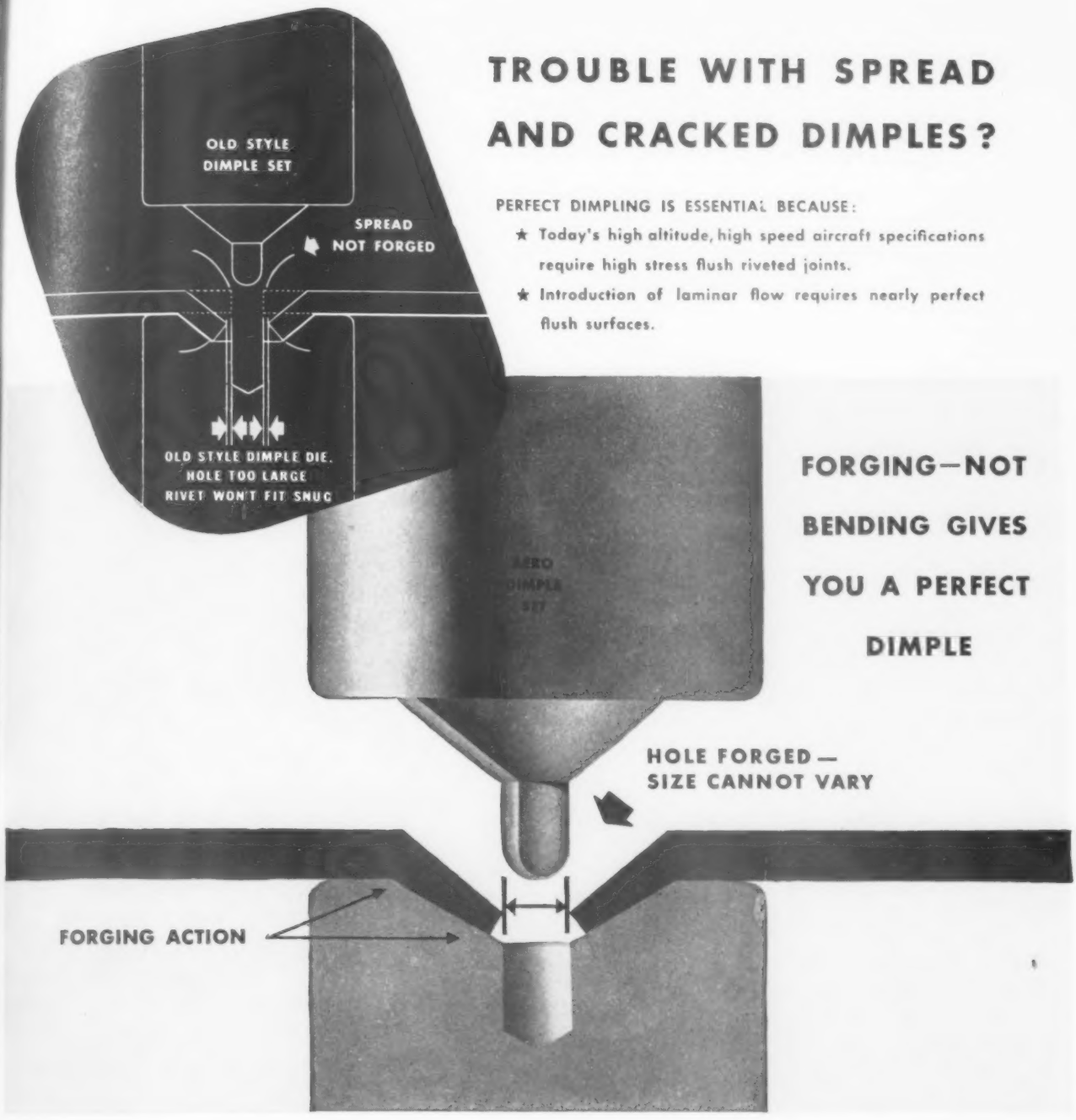

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We'll let this Record Speak for ITSELF

THIS Production Test Run showed performance of Cortland Chuck and Segments to be *outstanding in so many ways* that we're giving you the detail without any fancy headlines.

The test took place in a large war plant producing armament. Flat surface grinding of machine gun part was done on a Blanchard No. 18 Vertical Surface Grinder; wheel speed 705 R.P.M. Surface ground per piece, 2.52 sq. in.; 160 pieces per table load.

The use of Cortland Chuck and Segments produced better finish, entailed far less wheel wear—and required less grinding time for the work.

Records like these are not magic. They simply show the sound common sense engineering that is back of *Diagonal Shearing*, as embodied in the design of Cortland Chuck and Segment Assemblies.

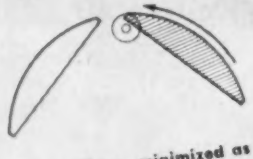
PRODUCTION TEST RUN

	Cortland	Brand Formerly Used
Cubic inches of stock removed per inch in height of segments	723	584
Ampere Readings	40	50
Dressings Necessary	None	6
Work Heat?	No	Yes
Grinding Time	9½ Min.	16 Min.

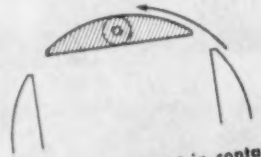
These features are improving and speeding grinding output wherever a segmental chuck can be used.

Write for the Segmental Chuck bulletin—free; and for information on Cortland Grinding Wheels of all types.

DIAGONAL SHEARING



Shock and resistance minimized as narrow end of segment starts grinding action. Large surface still exposed to coolant. Diagonal motion of straight inner edge of segment produces powerful shearing action. Increasing contact combines rapid stock removal with minimum heating.



Maximum area of segment in contact with work momentarily. As segment continues to pass across work, grinding area becomes smaller, with more surface exposed to coolant.

CORTLAND *Segmental Chucks*

CORTLAND GRINDING WHEELS CORP. • CHESTER, MASS.

Spotter for undersea raiders...

SEA LIONS beat their cousins, the seals, out of an important job during the early part of World War I. Both have a hoarse, barking voice. But sea lions have sensitive, external ears... seals do not.

So sea lions got the job of detecting U-boats. They were trained to bark like fury whenever they heard the vibrations of an approaching undersea raider.

Today, there are many devices for detecting the approach of submarines, but none of them depends on animals. All either depend on machines, or they are constructed with the help of machines.

The heavy responsibility of these machines is illustrated by the fact that during the last war, German U-boats destroyed 5,408 vessels, or 11,189,000 gross tons of shipping. Today, Germany is building 20 submarines a month, each of which can potentially sink, on a single raiding trip, as many as 14 ships!

But this is only one of the wartime responsibilities of the machine tool industry. Our nation's production of airplanes, tanks, jeeps, anti-aircraft guns and munitions—all this stems from machine tools.

In wartime production, when speed is vital, the output of Cone Multiple Spindle Automatic Lathes is of especial importance. These machines can, in many operations, increase the production range as much as 10 times, depending on the character of the work. This is one of the reasons why Cone Automatics will continue to make [illegible] victory is won.

CONE Automatic Machine Company, Inc., Windsor, Vermont

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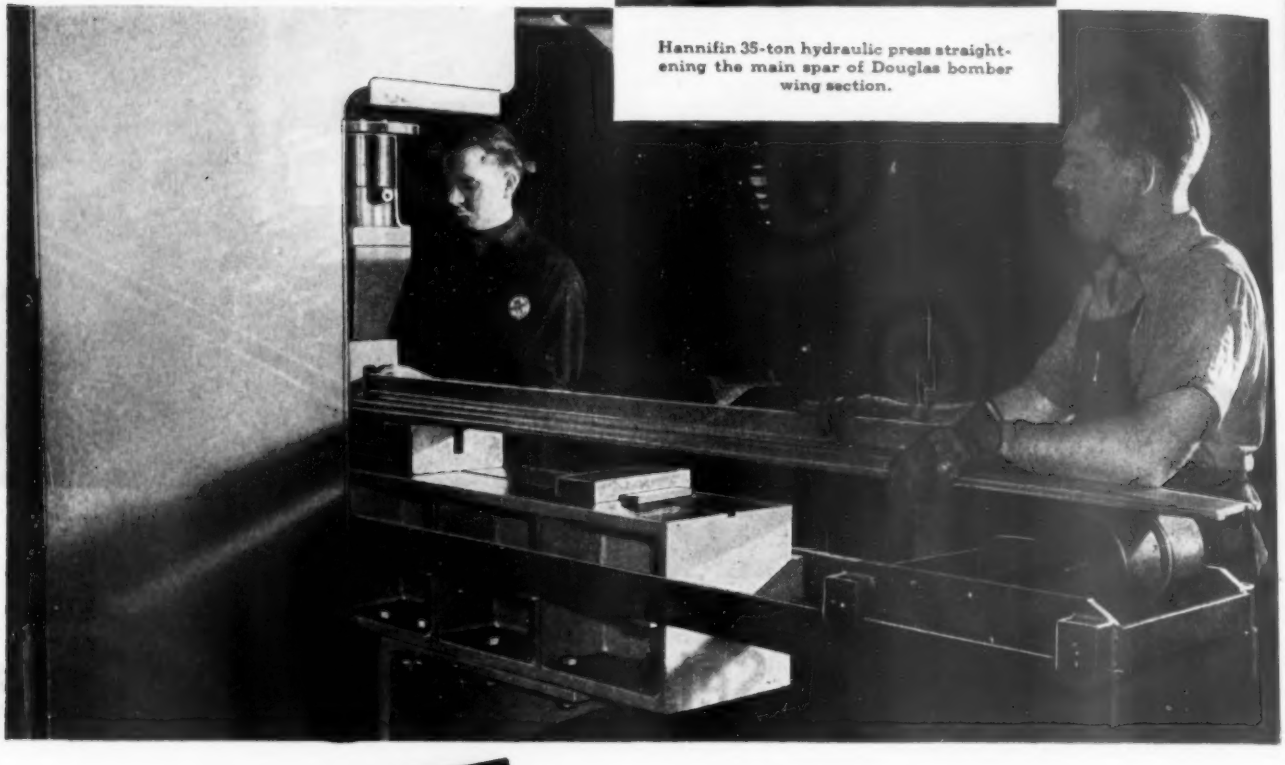
DEPEND ON DOUGLAS

Hannifin 35-ton hydraulic press straightening the main spar of Douglas bomber wing section.



For fast, accurate straightening operations, depend on . . .

HANNIFIN

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Performance in the field and production in the great Douglas plants reaffirms day by day the soundness of that phrase, "depend on Douglas." That dependability in turn rests upon thousands of design and production details combining precision and high output. Not the least of these are straightening operations on wing section main spars, and similar parts.

Hannifin hydraulic presses provide for accurate straightening, and fast, easy handling. Sensitive pressure control is so simple and natural that the operator's skill and attention are devoted to the work and control becomes almost automatic. Proportional control of ram pressures with a finger-tip touch of the control lever gives infinitely variable ram pressures over the entire range from a few pounds to full press capacity. Accurate straightening work can be carried on at consistently high production rates.

Hannifin hydraulic presses are built in a wide range of standard types, capacities from 5 tons to 200 tons, for straightening, forming, press-assembly, and similar operations. Standard designs can be readily modified to provide the table construction, gap, reach, speeds and stroke to meet individual requirements. Write for descriptive bulletins, or consult Hannifin engineers for specific recommendations.

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PRODUCTION PERSPECTIVES

T.M. REG. U.S. PAT. OFF.

War Production: Total output in May remained unchanged, has failed to rise substantially for 3 months. The overall program remains behind schedule. Good battle-front news continues to depress worker output....Compared with preceding month, May totals showed: All munitions, no change; aircraft, up 5 per cent; ground ordnance, down 3 per cent; Navy & Army vessels, up 2 per cent; merchant ships, down 4 per cent; miscellaneous munitions, down 7 per cent....June output: Preliminary surveys are more encouraging, indicate upward trend has been resumed.

Hot Spot: Aircraft is under pressure. Hope is for output of 8,000 planes in July. Schedule for last 6 months of 1943 requires output double that of the first two quarters....Shipbuilding: Despite a drop in May launchings, 168 vessels were completed. Everyone was satisfied. Construction far outdistanced sinkings; 44 percent of the year's objective was completed. June construction rose again.... Summary: WPB Chief Nelson forecasts United Nation's 1944 war production will be 4 times that of the Axis. Army Ordnance Says: Since Pearl Harbor, U. S. Industry has turned out 37,000 tanks, 1,000,000 machine guns and 14,000,000,000 rounds of ammunition. Navy Production Progress: More than 6,000 craft of all classes during the first half of 1943, 250 per cent increase over the same period last year.

Changing Scene: With expansion of production facilities completed, most industrial conversion is resulting from changing military material designs and demands....Eight Army Ordnance plants have been placed in standby condition, closed or their completion halted. Reason: Unexpectedly high British production.... Small Plants: Situation improving. Smaller War Plants Corporation has helped 4,000 firms secure prime contracts valued at $750,000,000, and 4,000 small concerns obtain subcontracts totaling $251,000,000. Government figures show 60 per cent of 62,000 U.S. plants employing less than 125 persons are engaged in war production. Seventy-one per cent of these say they could increase output; 60 per cent report they are confronted with manpower and material shortages. Same problems are less serious among big manufacturers.

Materials: Growing belief is that cut-backs in certain munitions will make limited quantities of vital materials available for civilian production. Recent allocation of steel for farm machinery was widely interpreted as portending early and substantial reconversion. Don't get too optomistic about the 1943 outlook. There is no extra steel capacity in sight for additional civilian production this year. Railroads, badly in need of rolling stock replacements, will get the first break. The 1944 outlook is favorable. Limited reconversion is fully anticipated in the most conservative quarters.

Reconversion: Everything depends on critical materials....Yet, War Mobilization Director Byrnes says there's a possibility of releasing more supplies for civilian goods, adds that this is "a hope and not a prediction"....The WPB definitely is working on plans to commence industrial reconversion within 12 months....Keep your eye on Detroit. All motor concerns are expanding their consumer advertising programs. Officials refuse to explain. Implication: An auto market may be just around the corner.

Machine Tools: May witnessed further tapering off of shipments as totals dropped 3.7 per cent. April output was valued at $118,024,000; May output, $113,710,000. WPB figures show May orders down 16 per cent over preceding month, but the industry expects total 1943 production to exceed $1,000,000,000.

HERE it is, ready for you. Twenty pages of tool-saving, time-saving, tool-crib arrangements used in many of the nation's busiest plants — who have problems like yours. Faced with a shortage of small tools, many plant managers have found that careful tool crib planning means more effective use of the tools they have. This book shows how they do it. This is not a book of theory — every photograph in it shows how a real plant has made a real saving. "Greenfield" wants you to have a copy, as part of our contribution to the united effort. Send your reservation today . . . use the coupon below.

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Fluids for Metal Cutting

Practical aspects of machine production and surface finish as they are related to tool wear.

J. T. BEARD
STAFF ENGINEER
SOCONY-VACUUM OIL COMPANY, INC.

SINCE the life of cutting tools depends upon their resistance to the tempering effect (softening effect) of heat developed during machining, the selection of a suitable cutting oil is determined largely by factors that produce this heat, namely, *cutting pressures, rubbing speeds, coefficient of friction.*

CUTTING PRESSURES

The cutting pressures exerted on a tool comprise—

(a) a **lip pressure** which varies from minimum to maximum, depending upon the smooth or spasmodic nature of the plastic flow within the chip;
(b) a variable **radial pressure** at the nose or tip of the tool (immediately below the cutting edge), due to the variable lip pressure, the lack of rigidity of the tool and its consequent periodic deflection against the work;
(c) a **feed pressure** against the side or cutting edge of the tool, due to its rate of feed.

Average lip pressures range from 50,000 to more than 400,000 psi., depending on such factors as the type of metal, Brinell hardness, rate of feed, depth of cut, and rake of tool. Thus, the lip area is known as an *extreme-pressure area* (Figure 1).

The variable radial pressure at the nose or tip of a tool also depends for its intensity upon the same factors affecting lip pressure. Since this area is never under continuous nor extreme pressure, it may be referred to as a *boundary area* (Figure 1). The pressures in this area never reach the intensities encountered in the extreme-pressure area.

Feed pressure against the side or cutting edge of the tool is also variable and is approximately one-third of the lip pressure.

RUBBING SPEEDS

These tremendous pressures would have little or no detrimental effect on a cutting tool if they were merely static pressures—in other words, if the chip or ribbon were not rubbing against the lip of the tool, and if the nose and cutting edge were not rubbing against the work-piece. The speed of this rubbing, therefore, is a determining factor in the destructive effect which these cutting pressures exert.

Rubbing speed on the flank of a tool, at the cutting edge, is identical with the surface speed of the work-piece; and the same applies to the rubbing speed at the nose or tip of the tool, whenever it deflects against the work.

The speed of rubbing between the chip and the lip of the tool, however, is not necessarily equal to the surface speed of the work-piece. For example, in the machining of brittle metals like cast iron (Figure 2), the rubbing action of the chip on the lip of the tool is almost negligible, since the chips break away immediately from the metal that is cut. The plastic flow in ductile metals like hot-rolled low-carbon steel, however, is sufficient to produce a continuous chip (Figure 3), which bears heavily and rubs continuously on the lip of the tool.

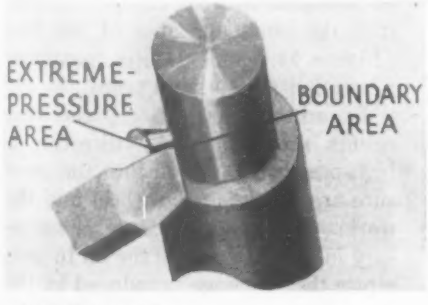


Figure 1—Two areas of a cutting tool can be protected by a suitable cutting oil — an extreme-pressure area on the lip of a tool, and a boundary area at the nose or tip (immediately below cutting edge).

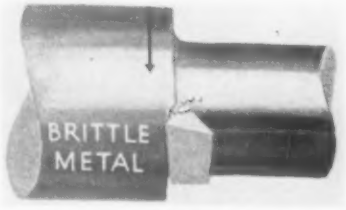


Figure 2—In machining brittle metals like cast iron, the chips break away immediately from the work-piece, and the rubbing action on the lip of the tool is almost negligible.

Figure 3—In machining ductile metals like hot-rolled low-carbon steel, the chip is continuous, and the rubbing action of the ribbon on the lip of the tool is severe.

THE BUILT-UP EDGE

Although the maximum temperature developed in a cutting tool is an important consideration, it is not the only factor that determines tool life. Of equal importance is the location of this temperature with respect to the cutting edge. This location depends on the size of the so-called "built-up edge."

In machining brittle metals like cast iron, however, no such build-up is present. The rubbing action, therefore, is localized right at the cutting edge. However, since this rubbing action is almost negligible, little heat is developed.

In machining semi-brittle stocks, such as cold-drawn or high-Brinell steels, there is a slight accumulation of build-up (Figure 4). Since this accumulation is small, the rubbing action is localized close to the cutting edge. However, in this case, a more or less continuous ribbon is formed, which bears heavily on the lip of the

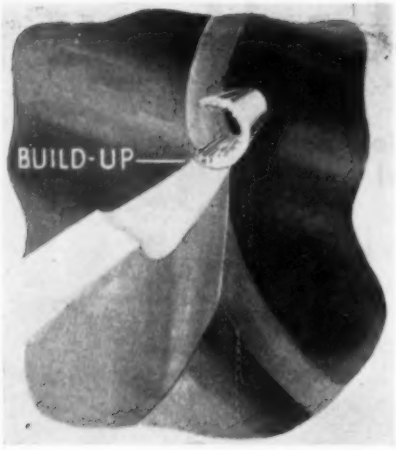


Figure 4 — In machining semi-brittle metals like cold-drawn stocks and high-Brinell steels, there is very little build-up to protect the cutting edge of a tool. Consequently, the severest rubbing action on the lip is localized near the cutting edge.

Figure 5—In machining ductile metals like hot-rolled low-carbon steels, there is a substantial build-up on the lip of a tool to protect the cutting edge.

Figure 6—A built-up edge localizes severe rubbing action of the chip at an appreciable distance from the cutting edge.

tool. Considerable heat is developed and, because the cutting edge is not well protected, tool life may be relatively short.

In machining ductile metals, such as relatively soft hot-rolled stocks, the amount of build-up is large (See Figures 5 and 6). In such cases, the rubbing action is localized at an appreciable distance from the cutting edge. This protection results in long tool life.

FUNCTIONS OF A CUTTING OIL

As far as tool life is concerned, therefore, the function of a cutting oil is to minimize the heat developed in the several areas of a cutting tool by *minimizing the friction* between tool, chip and work-piece. And an equally important function is to *localize the rubbing action* of the chip away from the cutting edge by maintaining an *adequate build-up*.

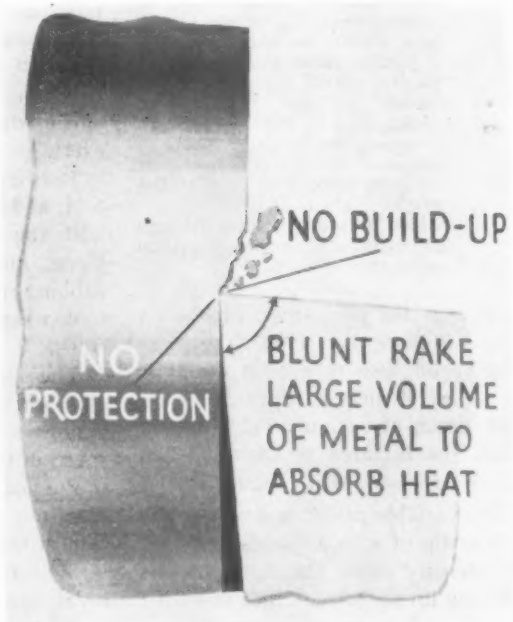


Figure 7 — Satisfactory finish can be secured in the machining of brittle metals like cast iron with a fairly blunt rake, because there is no build-up to slough between the tool and the work-piece and to mar the finish. This blunt rake provides a sufficient volume of metal in the tool to absorb the heat that is generated and to prolong tool life.

It should be borne in mind, however, that the presence of excessive build-up can be detrimental, since the excess, instead of sloughing with the chip, is squeezed between the tool and the work-piece, thus producing a roughened finish. A suitable cutting oil, therefore, must *control the size of the build-up* in such a way that the cutting edge of a tool is not protected at the expense of the finish of the machined parts. Moreover, wherever build-up exists, the temperature of the cutting operation must be maintained sufficiently low to prevent the build-up from welding to the tool and scratching the machined surfaces. Thus, another important function of a cutting oil is to *keep the tools and work-piece sufficiently cool*.

The satisfactory performance of a cutting oil depends also on its ability to protect the boundary areas from excessive wear, which would have the effect of shortening the tools and increasing the diameter of the machined stock.

METHODS OF APPLICATION

Since there is no opportunity for introducing the oil where the cutting edge bites into the metal, the heat developed in this area cannot be reduced in any way. Fortunately, however, the microscopic vibration of the tool, caused by the rapid variation of lip pressure, produces periodic minute openings between the nose or tip of the tool and the work-piece.

In machining operations, therefore, the best results are secured by directing a large volume of oil on the upper surface of the chip and tool, in order to keep the chip and tool as cool as possible. In addition, a second stream of oil should be introduced, if possible, into the boundary area of the tool (Figure 7). This assures maximum protection at this vital point.

In grinding operations, the best results are secured by directing a high-pressure jet of oil into the pressure area between the wheel and the work. This high pressure is necessary in order to enable the oil to penetrate the "windage" produced by the

high peripheral velocity of the wheel. In thread-grinding, it is desirable to place such a jet on each side of the wheel (Figure 8).

CHARACTERISTICS OF CUTTING OILS

In addition to proper application, cutting oils must have those characteristics which permit them to perform their necessary functions to a maximum degree.

These characteristics are as follows:

(a) **Adequate Pressure Resistance**—to minimize friction and to prevent periodic seizure between the chip and the lip of the tool, thus minimizing tool vibration.
(b) **Proper Anti-Weld**—to prevent excessive build-up on the lip of the cutting tool, thus securing satisfactory finish by keeping the build-up mobile and sloughing with the chip; and, at the same time, to maintain sufficient build-up to localize the rubbing action of the chip away from the cutting edge of the tool.
(c) **Adequate Lubricity**—to minimize the development of frictional heat in the boundary area of the cutting tool.
(d) **Maximum Cooling Ability**—to carry away as much heat as possible.

SELECTION OF A CUTTING OIL

In order to select a correct oil for a job or range of jobs the following information is necessary:

- TYPE OF METAL: S.A.E. Number or A.I.S.I. Number or N.E. Number or Trade Name or Chemical Composition
- CONDITION OF METAL: Brinell Hardness or Rockwell Hardness (B or C) or Hot-Rolled, Cold-Drawn, Annealed, etc.
- OPERATING CONDITIONS: Cutting Speed (Surface feet per min. or R.P.M. and Diameter); Rate of Feed (in per rev.)

When this information is available, and when the correct cutting oil has been properly applied, the satisfactory performance of the cutting tools will be evidenced by—

(a) Moderate temperature of cutting oil;
(b) No "smoking" at the cutting tools;
(c) Machined parts are only moderately warm;
(d) Chips are bright and "shiny";
(e) Tools are bright and polished;
(f) No evidence of welded build-up on cutting faces;
(g) Tools cut quietly and smoothly;
(h) Tool life is long;
(i) Finish of machined parts is satisfactory;
(j) Oversize is eliminated.

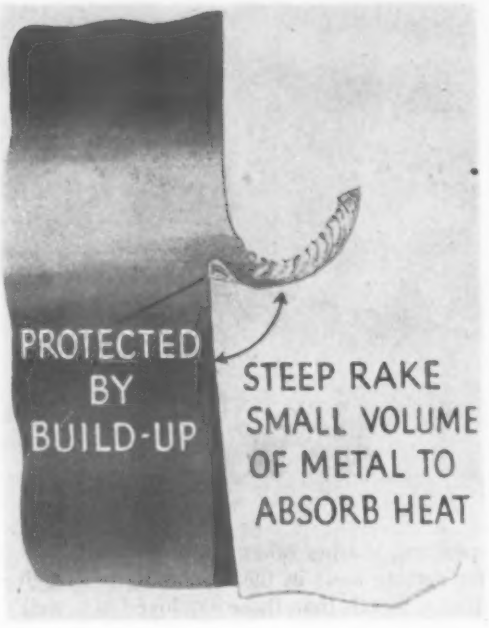


Figure 8—In order to secure a satisfactory finish in the machining of ductile metals, a relatively steep rake is necessary, in order to permit the build-up to slough in the direction of chip flow instead of between the tool and the workpiece. Although the volume of metal in the tool is reduced, and its capacity to absorb heat lessened, nevertheless the presence of adequate build-up at the cutting edge assures reasonably long tool life, provided the rake is not too steep.

PRACTICAL SUGGESTIONS

If the tools do not perform satisfactorily, it must not be assumed immediately that the oil itself is at fault. Actually the trouble may be a mechanical fault. It is seldom practical or economical to attempt (except in emergency) to remedy them by making adjustments to the cutting oil itself. The following possible mechanical causes should be investigated first—

(a) **Cutting Tools**
  1. Cutting angles
  2. Cutting surfaces
  3. Hardness
(b) **Cutting-Oil System**
  1. Volume of flow (Figures 7 and 8)
  2. Points of application (Figures 7 and 8)
  3. Contamination with bearing oil
(c) **Machine**
  1. Looseness of spindle bearings, slides, collets, toolholders
  2. Overhang of tools
  3. Condition of cams and feed-screws
  4. Vibration of machine
  5. Hydraulic action (if any)
(d) **Metals**
  1. Variation in hardness
  2. Variation in micro-structure
  3. Variation in grain size
  4. Variation in composition

● *Angles of Cutting Tools* — The cutting angles that are generally employed on high-speed-steel tools in the machining of various steels depend to a great extent on the conditions encountered in any given shop. These conditions are variable, and include speeds, feeds, type of tools, and cutting qualities of the metals (clean-cutting or draggy). Moreover, many shops are confronted today with the problem of machining materials they have never cut before. Generally

Figure 9—In general-machining operations, a large volume of oil should be directed on the upper surface of the chip and on the tool. The consequent cooling of the chip and workpiece makes the metal cleaner cutting; and the cooling of the tool aids in prolonging its life. Wherever possible, it is desirable to introduce a second stream of oil into the boundary area of the tool. This second application improves both tool life and finish.

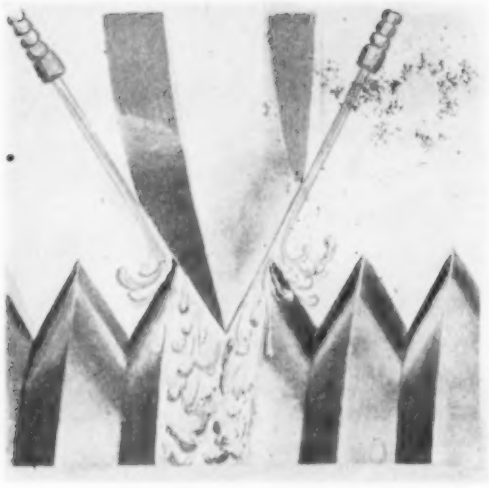


Figure 10—In thread-grinding, the "windage" produced by the high peripheral speed of the grinding wheel tends to prevent a cutting oil from reaching the pressure areas between the wheel and the threads that are ground. In order to enable the oil to penetrate this windage, and to assure adequate protection of the wheel and work, it is desirable to utilize two high-pressure jets of oil—one located on each side of the wheel, and directed into the pressure areas.

speaking, sharper rakes are employed for cutting tools in the machining of draggy metals than those employed in cutting clean-cutting stocks (Figures 9 and 10). Too-blunt a rake may give long tool life, but it may also permit excessive accumulation of build-up, and thus result in poor finish. Too-sharp a rake may result in a good finish, but it may also leave the cutting edges unprotected, and thus result in short tool life.

● *Surfaces of Cutting Tools* — The cutting surfaces of tools should be as smooth as possible in order to minimize the friction between tools, chips and work-piece, and to prevent the development of excessive heat which reduces the resistance of the tools to wear. Even microscopic scratches materially shorten tool life. After grinding, it is considered good practice to "stone" the surfaces of the tools (particularly the lips).

● *Hardness of Tools*—Under ordinary conditions, there is little variation in the hardness of cutting tools. The standard hardness for 18-4-1 high-speed-steel tools is 62/63 Rockwell C. However, the heat-treatment to which the cutting tools are subjected does not always produce the desired hardness. Naturally, if any set of tools is softer than the previous set or sets, there will be a material reduction in tool life, because the softer tools do not have the same resistance to wear.

● *Contamination with Bearing Oil* —The contamination of the cutting oil with the oil in the bearing lubrication system usually affects the cutting oil in three ways. *First,* it usually changes the viscosity of the cutting oil, and, therefore, its cooling properties. *Second,* it dilutes the pressure-resisting, anti-welding and lubricity ingredients in the cutting oil. *Third,* it may introduce additional lubricity properties into the cutting oil if such properties are present in the bearing oil.

The contamination of a cutting oil with bearing oil may actually have a beneficial effect on performance if the cutting oil has not been properly selected in the first place. However, the continued dilution of the cutting oil with bearing oil will eventually affect adversely the performance of the tools. Whether the performance is immediately or subsequently impaired, steps should be taken to minimize this leakage. For example, ineffective seals should be renewed if possible. If the leakage cannot be prevented, the problem should be studied with a view to determining the amount of this leakage, the effect upon the cutting oil, and the amount and type of oil that should be used as make-up, in order to maintain the proper condition of the cutting-oil system. Sometimes the situation can be met satisfactorily by using the same *non-corrosive oil* in both the cutting-oil and bearing-oil systems.

● *Variation and Hardness, Micro-Structure, Grain Size, Composition*— It is not unusual to encounter considerable variation in the physical and metallurgical properties of the metals that are machined. As a matter of fact, there may be considerable variation in one batch of steel, as compared with a previous shipment. Although a good cutting oil is not too sensitive to these variations and should enable the tools to perform satisfactorily, nevertheless such variations may be sufficient to show a material variation in performance.

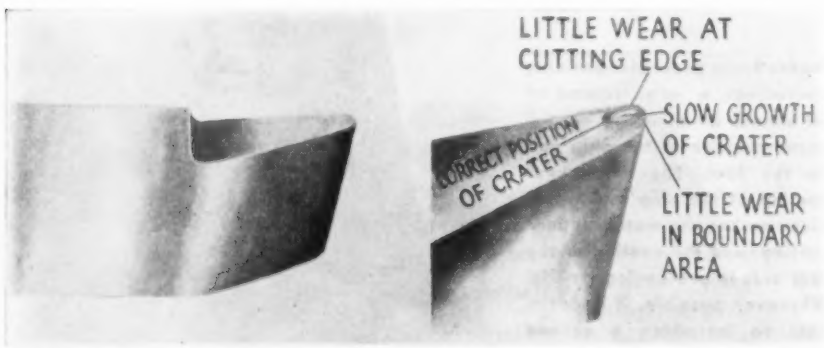


Figure 11—When the wear on the lip of a cutting tool is observed in the form of a crater near its cutting edge, this condition indicates the presence of a protective build-up which prolongs tool life. Moreover, the boundary area should also be well protected and should show very little signs of wear. As long as tool life and finish are satisfactory, this is the ideal condition.

EXAMINATION OF TOOL WEAR

When the mechanical conditions of a cutting operation appear to be satisfactory, but the performance of the tool is below standard, it can be assumed that, because of the meager information available, the cutting oil was not correctly chosen. An examination of the cutting tools will show wherein it was deficient. The critical tool (*i. e.* the tool that was causing the trouble) should obviously be examined first.

If the oil has been properly selected and applied, the wear on the cutting tools will appear first in the form of a crater back of the cutting edges, showing that these edges have been protected by adequate build-up (Figure 11). At the same time the finish will be satisfactory, and the wear on the lip will be so gradual that the life of the tool will be prolonged. Eventual breakdown will be evidenced by "oversize" of the finished parts, poor finish, or both. During this interval,

there is little or no wear in the boundary areas of the tools, showing that they were likewise well protected. This is the ideal condition.

It should be borne in mind, however, that the appearance of a crater on the lip of a cutting tool does not necessarily indicate that the oil has been properly selected. This is true only if the use of the oil is accompanied by good finish and long tool life.

When the desired crater is observed on the lip of a cutting tool, but the life of the tools is short, excessive friction between the chip and the tool is indicated. This increases the rate of lip wear, so that the rim of the crater rapidly approaches the cutting edge of the tool, at which time the tool breaks down.

A crater is usually observed on the

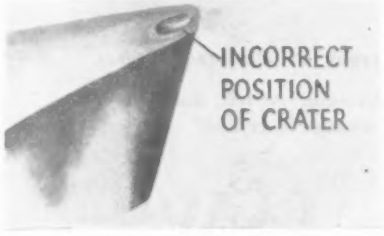


Figure 12—The location of a crater on the lip of a tool at a considerable distance from the cutting edge usually indicates the presence of excessive build-up, and nearly always results in unsatisfactory finish. This condition can be improved either by utilizing a steeper rake or by properly adjusting the cutting oil to permit the build-up to slough more readily with the chip.

lip of a cutting tool when an excessive accumulation of build-up sloughs between the tool and the work-piece and mars the finish during the entire cutting operation. Under such conditions, the crater itself is found at a reasonably great distance from the cutting edge (Figure 12).

It is sometimes observed that, although a crater appears on the lip of a cutting tool, the build-up itself has actually welded to the tool (Figure 13). Under such conditions, the surface of the machined parts is more or less scratched by the welded build-up. Two factors contribute to this welding: *first*, the build-up itself is not mobile, but lies idle at the tip of the tool; and *second*, the heat at the tip of the tool is sufficient to weld the build-up to the tool.

Wear in other areas of cutting tools frequently results in poor finish or causes tool life to be shortened.

For example, the absence of build-up on the lip of a cutting tool leaves the cutting edge of the tool unprotected and, therefore, localizes the rubbing action of the chip right at the cutting edge. The severe wear that accompanies this condition flattens the lip of the tool (Figure 14), and actually changes the rake so that it is more difficult for the chip to escape. The increased pressure that is then necessary to produce chip flow results in periodic seizure between the chip and the lip of the tool, thus producing excessive tool vibration, chatter marks, and sometimes "squealing" of the tools. Moreover, this vibration, even though microscopic, permits the excessive cutting pressure to squeeze whatever build-up may be present between the tool and the work-piece. The result is a "sand-blast" finish.

When excessive wear flattens the lip of a tool at the cutting edge (Figure 14) and thus necessitates greater cutting pressures in order to promote chip flow, these increased pressures develop correspondingly greater heat, which tends to draw the temper of the tool and reduce its resistance to wear. Moreover, the lack of build-up, which causes this condition, leaves the cutting edges without protection. The consequent exposure of the edge of the tool to excessive temperatures shortens its life.

Excessive wear in the boundary area of a cutting tool (Figure 15) permits whatever build-up may be present to slough between the tool and the work-piece and mar the finish. Moreover, this sort of wear changes the clearance between the tool and the work-piece. As a result of this condition, the tools do not cut cleanly, but rub severely against the work and produce a burnished surface. In addition, this wear, in the boundary area shortens the length of the tool and results in the production of oversized parts.

The excessive rubbing that accompanies wear in the boundary area of cutting tools results in the development of high temperatures, which tend to draw the temper of the tools, and shorten their life.

THE END

• The Split-Shift Plan is argued pro and con among employers. How one machine tool builder is getting along with white-collar workers on four-hour shifts, is described in a short, meaty article on page 118.

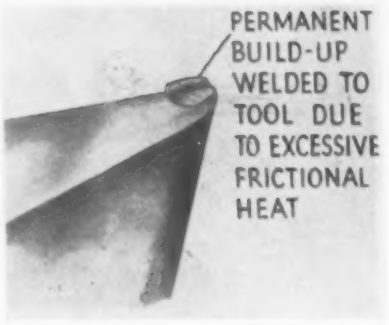


Figure 13—the welding of a build-up to the lip of a cutting tool indicates excessive heat, as well as the inability of the build-up to slough away rapidly enough with the chip. This condition can sometimes be corrected by using a steeper rake, but usually requires an adjustment of the cutting oil.

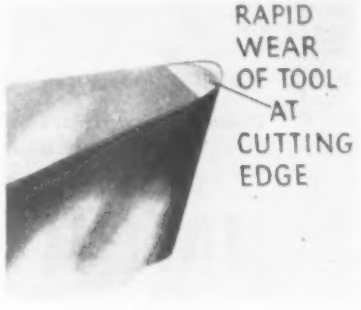


Figure 14—When the wear on the lip of a cutting tool is observed at the cutting edge, this condition obviously indicates the complete absence of any protective build-up. In the machining of brittle metals, this condition is sometimes improved by using a blunter rake. In machining ductile metals, suitable adjustment to the cutting oil prevents the rapid escape of the build-up with the chip.

Figure 15—Wear in the boundary area shortens the tool and results in oversized parts. Moreover, this wear alters the front clearance. The tool does not cut cleanly, but rubs heavily on the work-piece, thus generating excessive heat. This condition can be remedied by adjusting the cutting oil.

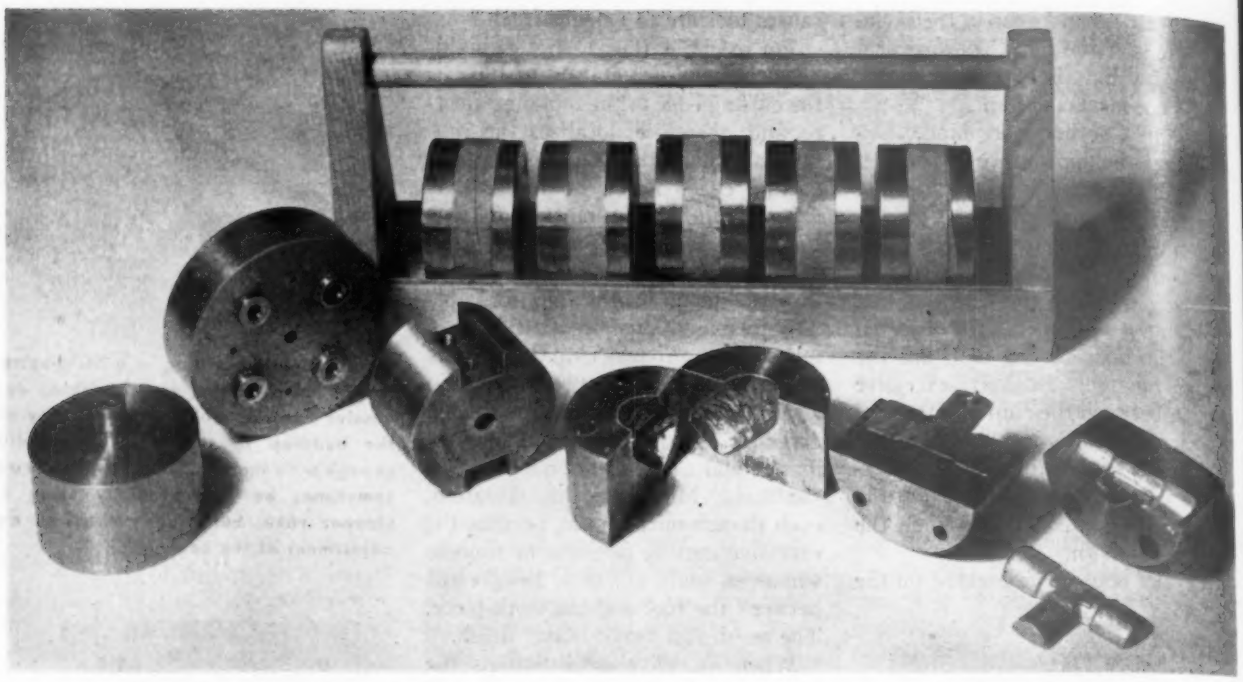


FIGURE 1. These completed jaws are universally adapted to various types of clamping fixtures.

Photo shows, *at right*, a cast jaw, sawed apart, with the forged part used in forming. At left, the drill jig used in finishing jaws. Completed units in rack are ready for storage in crib.

IMPRESSION-CAST JAWS

Saving vital man-hours, an aircraft fittings manufacturer casts metal jaws from Kirksite "A", pouring directly around forgings to be machined. This method is available to all plants interested in speeding production of machined parts.

A set of Kirksite jaws is good for 8000 to 10,000 operations at top accuracy. Experiments promise to improve present rapid and economical replacement of jaws.

H. F. LENZ
CHIEF ENGINEER
AMERICAN SCREW PRODUCTS

CAST METAL JAWS to hold parts for machining operations have been used at some time by most shops. Usually they are made of brass, bronze or cast-iron and in most cases a certain amount of cavity finishing with highly skilled labor is necessary to make them usable. The users of jaws cast in lead, babbitt or fusible alloy have found them limited for high production because of the lack of durability.

The American Screw Products Company, in the manufacture of hydraulic fittings, long followed the common practice of machining the jaws out of steel. The procedure was naturally slow, expensive and efficient only with skilled labor. In an effort to comply with the War Production Board's request for greater production, experiments were made with a commercial type of fusible alloy cast around a forging to be machined, and subsequently separated into two parts or jaws. But the need for harder and more durable material finally led to the development of jaws cast from

FIGURE 1a. Kirksite "A" jaws in screw machine chuck. Are also used on multiple-spindle automatic chucking machines.

FIGURE 2. Jaws in air-operated vise for drill press. Ready application to oversize collets is also a time-saver.

the zinc-base alloy, Kirksite "A".

The method of making these jaws on a production basis has revolutionized the machining of forgings in this plant, saving a tremendous number of man-hours.

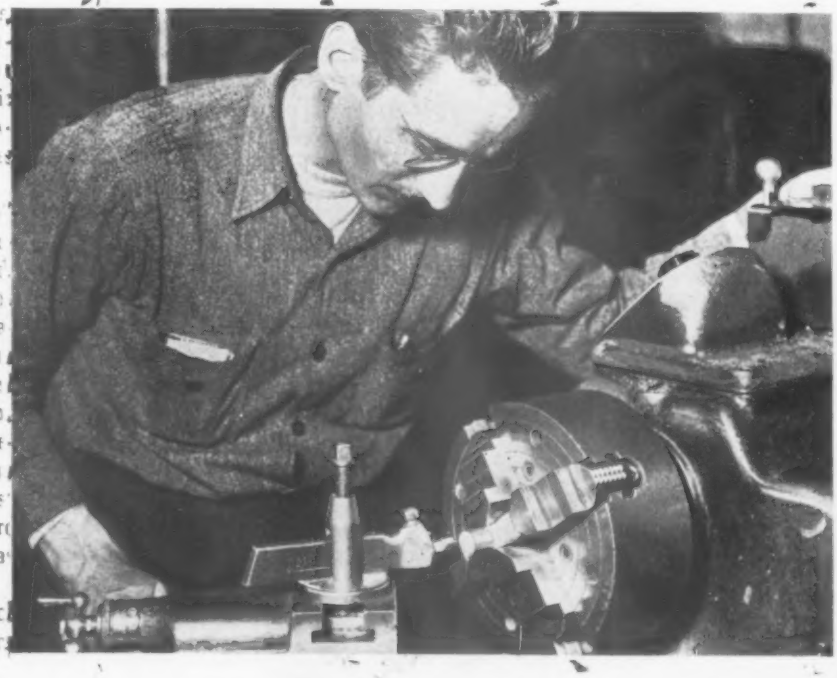
The particular value of the innovation (developed by close co-operation between the Engineering Department, Mr. Rudy Rosenow, Superintendent, and his assistants, Mr. George Erkelens and Mr. Joe Durgin) lies in its universal adaptation to the various types of clamping fixtures, chucks, over-size collets and vises. The completed jaws as shown in Figure 1 can be used in multiple-spindle automatic chucking machines, wire-fed screw machines (Figure 1a), turret-lathes and vises.

Two sizes of jaws (2⅞" and 4" outside diameter) accommodate practically all of the forgings processed. Made in sets of five pairs they can be used on the automatic chucking machines for long runs. If a short run is needed, any set can be mounted on the two-jawed air-chucks, the Barker wrenchless chucks or the special over-size collets of American Screw Products design. If a drill press operation is needed the jaws are mounted in an air-operated vise as shown in Figure 2.

The so-called "beginners" class of labor can be used on all operations required to produce a pair of jaws, and a pair can be completed in fifty minutes. With division of labor a set of five pairs of jaws can be made in approximately three hours.

Referring to Figure 3, attention is called to the first operation performed on the forging. One end of the forging is faced and turned to a fixed dimension to fit the particular bushing inserted in the adapter of the mold (Figure 4). A line is also inscribed on the faced end parallel to the other leg of the forging to direct the separation of the casting into halves. The forging is sprayed with graphitic separator and pushed into the hole of the adapter. The halves of

FIGURE 3. Turning and facing forged part, before making jaw mold ready. Making jaws on a production basis has revolutionized machining of forged parts.



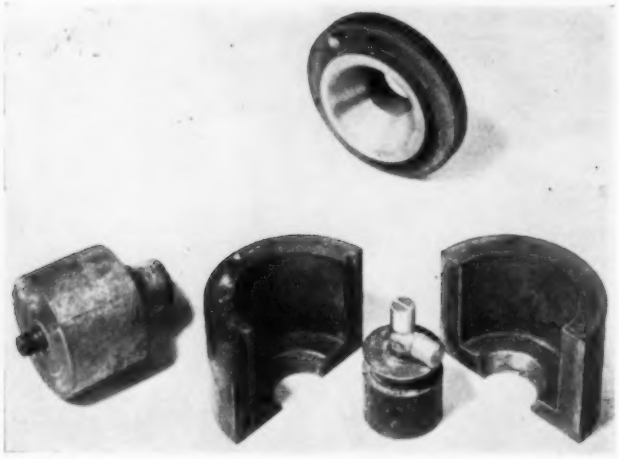
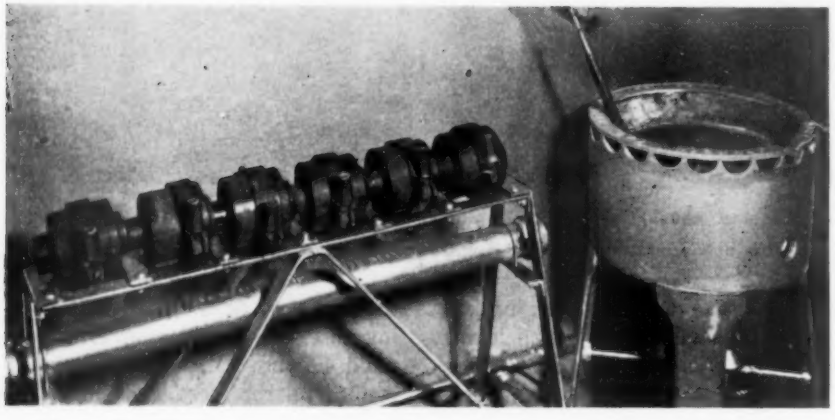


FIGURE 4.
Left
Halves of the mold and cap, ready to be placed around adapter and forging.

●

FIGURES 5, 5-a
Below and right
A specially-built burner for pre-heating molds, and the method of pouring into the molds.



the mold (Figure 4) are now placed around the adapter, the cap is put in place and the whole secured with the metal clamp.

A specially built burner permits five of the molds to be placed in a row for pre-heating and casting (Figure 5 and 5a). The pouring temperature of 820 degrees Fahrenheit is controlled by a pyrometer. As soon as the Kirksite has chilled, the cast slug is removed.

The turned portion of the forging protruding from the slug (that section shown inserted in the adapter, Figure 4) is now clamped in a true-running collet, and the outside diameter of the slug is finished with one cut and the end is squared. The casting is then reversed in a three-jawed chuck and faced to length. Four holes (in relation to the line scribed on the end of the forging) are then drilled in the jig shown in Figure 1 and counterbored for a one quarter inch socket head screws for adaptation to oversize collets. Two $\frac{7}{8}$" wide slots milled at 180 degrees to a depth of 7/16" are added (Figure 6) for adaptation to two-jawed air-chucks. Two holes for $\frac{3}{8}$" screws are then tapped in each slot for mounting in the two-jawed chucks or special false jaws. A drill jig, suited to the chuck, is used to drill and tap these holes.

The slug then goes onto a milling machine fixture such as is shown in Figure 6 where it is located by stops inserted in the slots and a $\frac{1}{8}$" or 1/16" saw is passed through separating it into halves. The split parts of the forging (Figure 1) are knocked out, the halves are suitably marked and after being taped together are sent to the tool-crib.

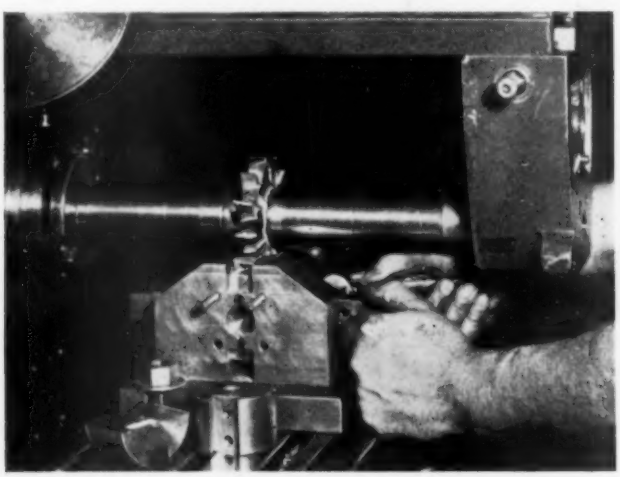


FIGURE 6.
Milling slots for adaptation to two-jawed air chucks.

The American Screw Products Company has found that operators and set-up men prefer this type of jaw to the old machined kind. Since they require no shimming nor adjusting and with the forging rigidly held because of the large area of contact, they produce superior work. With the best tool-making skill the conventional steel jaws can rarely be set up ready to go without losing valuable productive time. The jaws made in the described manner can be mounted quickly and the forging will run true. This makes possible an allowance of only 1/16" on the diameter of turning instead of the not uncommon allowance of 3/32" or $\frac{1}{8}$". A set of Kirksite jaws is good for 8000 to 10,000 operations without loss of accuracy. Rapid and economical jaw replacement makes this process a marked advance.

The American Screw Products Company is now experimenting with a design of mold which will cast the jaws completely cored, slotted and sized so that splitting into halves will be about the only operation necessary. As soon as the design has been perfected, this, as well as engineering service and data will be freely offered to war production plants. THE END.

PRODUCTION

MACHINE AND TOOL ENGINEERING

Machining contoured powder chamber of the 90 mm. gun. Air-driven grinding wheel on turret lathe replaces wood pack reamer.

"12 WAYS TO SAVE" • The second in a series of articles on streamlining production methods. Here are highlighted savings effected by the Chevrolet Division of General Motors. Operations are selected for their applicability to today's production problems in conserving man-power, vital materials and machine time.

12 Ways to SAVE

A cross-section of methods and applications employed by an automotive manufacturer to improve war tooling. From common-sense ideas in use of small tools to intricate special equipment, this story covers a wide range of production engineering.

JEROME S. WILFORD
ASSOCIATE EDITOR

Streamlined PRODUCTION

WITH other automotive manufacturers, the Chevrolet Division of General Motors brought to the war production job a kit full of tools, a head full of the know-how of putting jobs on production. Flexibility and adaptability required by conversion were familiar requisites for they had within recent months and years retooled for extensive passenger car model changeovers.

Yet, war production did bring new tests of ingenuity, made them discover new ability. And, it meant more than conversion. Getting the job under way was one story. The second phase, that of doing a better job in every way, presents even more helpful information for the production engineer today.

There have been problems for which these automotive engineers have been able to command little experience, just as there have been questions to which the answers have come as second nature. But, contrary to the beliefs of the man on the street, getting "over the hump" did not mean an end to problems. To Chevrolet engineers, every job is a production puzzle in the sense that it poses the question "How can it be improved?"

In streamlining its war production job, Chevrolet production engineers have been guided by a four-point standing order of the day:

1. *Save time and speed production*
2. *Improve functional operations and the product itself*
3. *Conserve vital materials*
4. *Reduce machine tool loads*

Presented here is a cross-section of the ways in which they have carried out this order. It is full of ideas which other production engineers can put to work. Not devoted to one product or type of operation, it covers in the vastly ramified Chevrolet operations, both small and large production applications which have been proved in the shop. Each example has been of help in the war program—large or small—in that each has been a link in the production line.

BORING 8 HOLES IN TRANSFER CASE

1. 58.8% production increase.
2. Increased tool and fixture life.
3. Lower cost, faster delivery.

Achieved by STREAMLINED PRODUCTION

TOOLING UP a 2-way Natco horizontal drill sounds like a simple order, unless the production deadline is four months ahead of delivery date on the tools.

When the job of building transmissions for military vehicles was first taken on by a Chevrolet plant, production engineers availed themselves of the services of an outside tool supplier. A serious bottleneck in machine tool orders was still a thing of the future. On one of the jobs, boring four holes, two ways, in the casting for the transfer case, back in 1940, they merely took a Natco machine off their service parts line and purchased drill heads and fixtures, complete with boring bars from an outside supplier. Production was 17 units per hour.

Came the order in 1942 to step up production in two months, and a second 2-way Natco drill was found at one of the Chevrolet plants. But obtaining drill heads and the piloting fixture was another matter. The best delivery date from an outside supplier was six to eight months and cost had risen 50 per cent.

The problem was solved by taking two of the transfer cases already produced and installing them in the machine for drill heads. Built to carry gears for power transmission, they also offered perfect alignment when used as drill heads. To prevent any possibility of run-out between drill heads and the fixtures supporting the boring bars, eight passenger car universal joints were installed in the spindles, between drill heads and fixtures.

Streamlined PRODUCTION

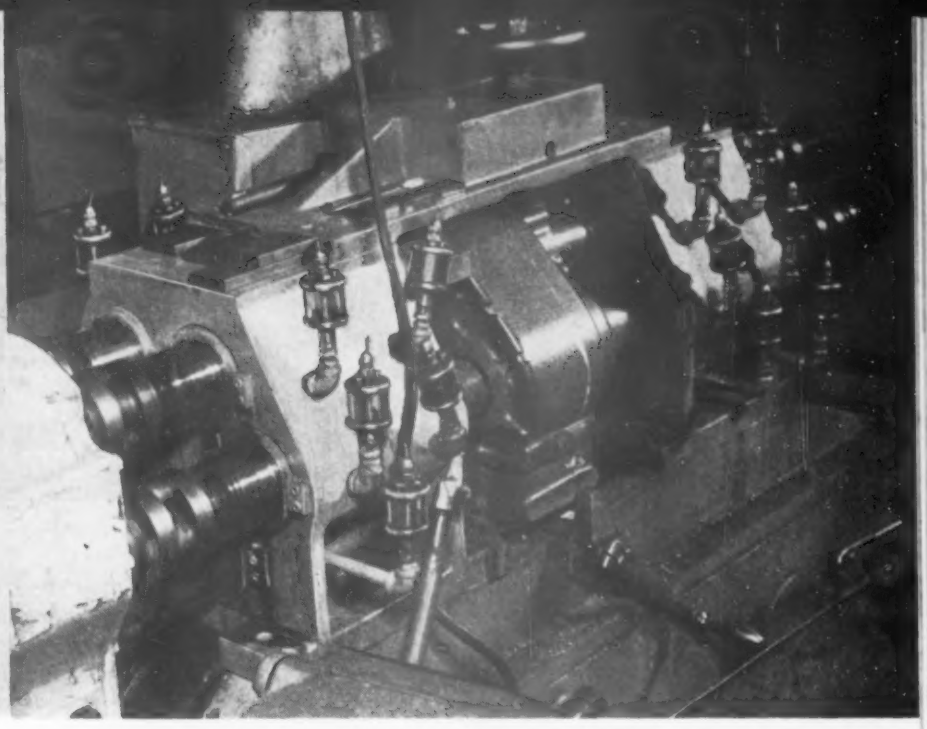
Right:

Natco 2-way drill, as first equipped with special head and piloting fixture for boring eight holes in transfer case.

Chevrolet photos

At bottom of page:

When outside supplier could not furnish head and piloting fixture to set up second 2-way horizontal drill, Chevrolet engineers used the part itself—a transfer case—for the drill head and also for the piloting fixture. Passenger car universal joints prevented run-out. New sleeve bushings conserved tools.



One feature was added in the design and construction of sleeve bushings for the piloting fixture. On the original equipment, bronze bushings were stationary—and the solid boring bar rotated in and fed in and out through the bushing. The result was that the bar dragged cast-iron dust into the bronze, impregnating it so that it had in turn an abrasive action on the bar. Following the improved design the sleeve bushing is mounted on ball bearings and feeds in and out with the bar, and the only action between bar and bushing is one of rotation.

This complete Chevrolet installation cost less than $4300, was produced within two months, and resulted in a 58.8 per cent production increase. The production date or deadline for completion of the contract was stepped up at least four months. Not the least of the accomplishments was conversion of one more piece of idle equipment.

When one of the Chevrolet plants converted metal-working equipment from cast iron to steel, it was faced with the necessity of installing coolant pumps. This item proved to be practically non-existent. Passenger car water pumps filled the bill, are still flowing cutting oil over hot cutting tips.

200 COOLANT PUMPS— IN A HURRY

WHEN a machine won't operate, or a war production job cannot be produced for lack of a small part, that part is as important as anything in the whole program.

One of the Chevrolet plants which converted from machining cast iron auto parts to machining steel parts for combat items was faced with the necessity of installing 200 coolant pumps on their equipment. Regular sources of supply could not produce the pumps—an item costing from $7.00 to $11.00—in time. From auto parts stock, a production man requisitioned 200 water pumps for the 1937-38 models—list price $5.50. These pumps not only satisfied the dire need, at the time, but they are still shooting a stream of coolant, washing away steel chips, carrying heat from the work, and keeping tools cool.

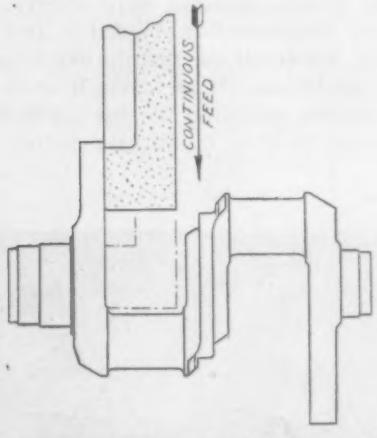
Streamlined PRODUCTION

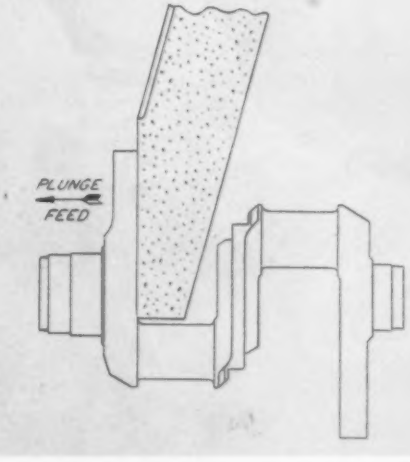
USING A PLUNGE FEED IN GRINDING

1. 200-300% production increase.
2. Improved surface finish.
3. Less possibility of taper.

Achieved by STREAMLINED PRODUCTION

IN THE FIRST rush of getting the job under way, subcontracting plants generally accepted and used the machining methods of the prime contractors. When those methods came from aircraft plants, where a handful of orders was a windfall in pre-war times, little stress or emphasis was to be expected in consideration of efficiency.





***Above:* Old method of face grinding crankshaft cheeks made slow, flat contact with work. Feed was back and forth, as well as into work. *Below:* Improved method, using angular grinder with plunge feed, upped production 200-300 per cent. Feeding in one direction only—straight into work—improved the product, minimized taper and resulted in better finish.**

In one of its plants building parts for the Pratt & Whitney engine, Chevrolet engineers improved the method of face grinding the crankshaft cheeks. Previously, standard practice had been to use a grinder making a slow, flat contact with the work. Wheel feed was back and forth across the surface, as well as into the work.

Increasing production 200 to 300 per cent, an angular grinder, with a plunge feed was used. Making complete contact with the entire surface to be ground, it was fed in one direction only—straight into the work. In addition to the production increase resulting from the faster operation, the product was generally improved. Single direction feed meant less possibility of tapered surfaces, and improved finish because of the better contact.

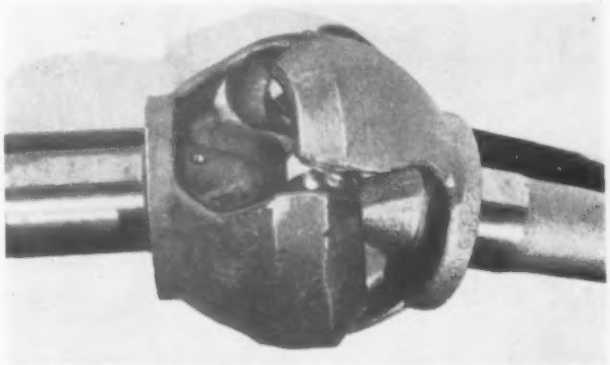
CONTOUR CONTROL ON VERTICAL SHAPER

ESTABLISHED procedure in profiling crankshaft counterweights for the Pratt & Whitney engine was to machine them on standard horizontal shapers, using a template for contour control. An operator was required for each machine. The wide range of experience and knowledge of machining methods which Chevrolet engineers had at their command led them to set the job up on a semi-automatic basis, relieving or saving 67 per cent of the man hours. The new tooling called for automatic contour control on a vertical shaper with Keller tracer control. Added to man-hour savings was a 75 per cent increase in vital machine capacity, and better work.

GEAR CUTTERS REPLACE SPECIAL MACHINES

KILLING two birds with one stone by putting an idle machine to work and doing the job better, Chevrolet production engineers applied Gleason gear cutters to the job of producing Weiss joints. These joints are used in the front wheels of military vehicles, where power must be transmitted to a wheel that is steered. Special machinery, previously used to cut them, was of such limited capacity that it was unthinkable to continue using it regardless of whether enough machines could be made available.

The gear cutters are producing at a rate of 234,000 joints per year, and this method has been adopted by other Weiss joint manufacturers.



The Weiss joint, used on military vehicles, permits the steering of front wheels to which power is transmitted.

Gear cutting equipment replaced special machinery for producing Weiss joints. This made possible meeting high war production demands.

Left: **Shotblasting aircraft gears saves tedious hand polishing, cuts production time required, by 90 per cent.**

Below: **Operator is installing gear and arbor which will be rotated before shotblast nozzle. This method affords the advantage of more uniformity in surface finish.**

SHOTBLASTING GEARS

1. **Relieves hand polishing.**
2. **90% production time saving.**
3. **More uniform surface finish.**

Achieved by STREAMLINED PRODUCTION

THE tedious process of hand-polishing aircraft gears to relieve angle stresses and other local strains has been eliminated at one of the Chevrolet plants producing parts for Pratt & Whitney engines. The shotblasting method has been employed with good results in its place.

Developing a hard surface, with more uniform surface dimensional characteristics than hand-polishing, it has saved 90 per cent of the time required by the former method.

Before a stationary nozzle, a moving fixture exposes the entire surface of the gear to the blast of shot which is so fine that no indentation is left on the surface, though it is quite sufficient to remove almost all surface imperfections. Just as with polishing, this is the final operation.

Both Wheelabrator and Pangborn equipment is used. The effect seems to be one of cold surface working of the metal, relieving strains and producing hardening to counter any softening effects which may have occurred as a result of decarburization.

TWO GRINDING APPLICATIONS

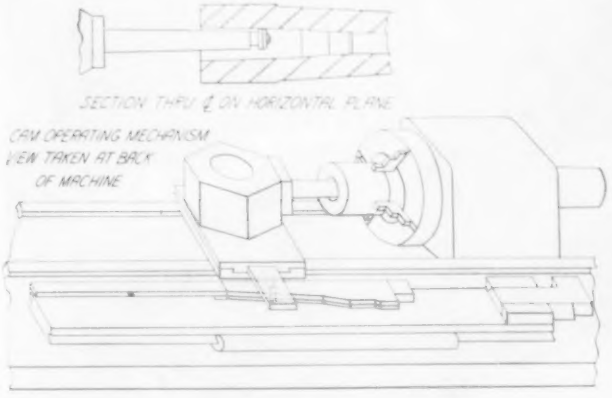
1. Improved product.
2. Increased production.
3. Materials and machine saving.

Achieved by STREAMLINED PRODUCTION

THE tapered sides of the powder chamber of the 90 mm. anti-aircraft gun have presented a finished machining problem, on a production basis, that was customarily solved by the use of wood-pack reamers. These two-bladed tools had their drawbacks for this particular job however, in that the compression of the wood occasionally resulted in scoring or chipping the workpiece surface. A constant drawback was the need for re-working the tools after each tube was finished.

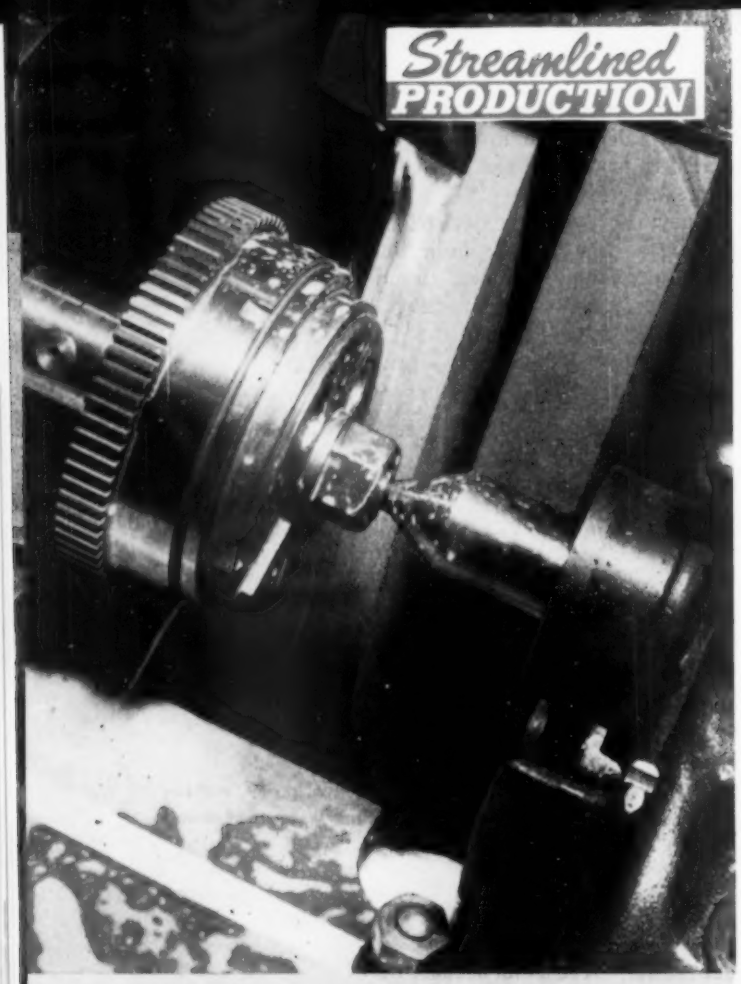
Though something like 15 hours was regularly required to complete a job, some jobs took longer. This was caused by damage to the work, which was so likely that the tube was always furnished longer than finish dimensions called for. Then in the event of damage, the tube could be advanced in the fixture and another cut made. Thus, even on parts where there was no need to take advantage of the extra length an extra machining operation was required in cutting off the unused portion of the tube, and scrap was produced.

Chevrolet engineers devised a grinding method, employing an air driven spindle, built into a turret lathe, with a profiling attachment to guide the wheel along the proper contour. This finishing operation required less



Turret with contour control in horizontal plane, making possible grinding of powder chamber instead of wood pack reaming.

Grinding contour, instead of using wood pack reamer, saved metal because barrel stock did not have to be furnished in extra length to safeguard against machining errors. Note air supply for pneumatic power to grinding wheel.



In grinding the reduction coupling drive for the Pratt & Whitney engine, a special mount provides for rough and finish grinding wheels, with diameters and spacing such that roughing wheel is not in contact with the work while finishing wheel is being used. Two operations are performed with one handling.

than eight hours, produced excellent finish and permitted using a workpiece cut to finish length in the first place.

Another grinding application combined two machining operations in one. Here the improvement was from one design of grinding equipment to another. To replace rough and finish grinding operations on separate machines, Chevrolet engineers developed a special grinding wheel mount to perform both operations in one handling.

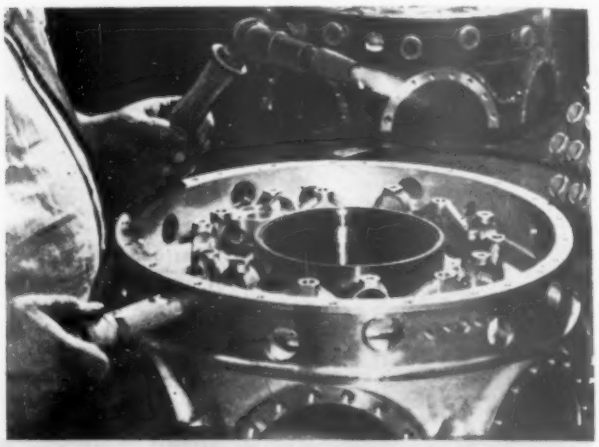
The part was the reduction coupling drive gear on the aircraft engine. The old method of grinding required rough and finish cuts, with separate handling on the O.D. of the gear, O.D. of the thread diameter and O.D. of the hub diameter. Production amounted to seven gears per day, and scrap and regrinds 28.4 per cent.

An attempt to use a compromise wheel for rough and finish work failed to produce the high quality demanded for these aircraft parts. The special mount which solved the problem of how to get more production was not only successful in meeting the immediate objective by raising production to 20 pieces, but it also resulted in cutting scrap and regrinds to five per cent, released one machine for other work, and improved quality of the finish.

The special mount provides for dual wheels, with diameters and spacing such that the roughing wheel is not in contact with the work while the finishing wheel is being used.

EXPANDING HOLES FOR BUSHINGS

HERE is one of those stunts that resulted from the application of common horse sense. It illustrates the point that with all the facilities which these big automobile plants have had at their disposal, they have at the same time scored heavily by exercising old-fashioned Yankee ingenuity. There has been as much horse sense per square foot of floor space in the mechanical accomplishment as in any alley shop that depends upon that quality for its bread and butter. Twenty-eight bushings, for valve tappet guides, are installed in the front and rear sections of the crankcase for the Pratt & Whitney engine. The old way of seating them was to expand each of the 14 holes with a blow torch. From 60 to 90 minutes is saved per engine assembly by slipping the bushings into place as the hot section comes from the enamel drying ovens. Speed is not the only result. The fit is better because expansion occurs under uniform temperature for the entire crankcase.



Old method of expanding holes for bushings in crankcase, consisting of applying blow torch to 14 holes. Time of 60 to 90 minutes per unit was saved by inserting bushings as the parts came hot from enameling oven *(as shown below)*.

VITAL MATERIALS SAVED

DESIGN alterations in both an armor piercing shell and a high explosive shell produced by Chevrolet plants resulted in considerable savings in copper and solder.

The sledge-hammer cap which softens up armor plate for the armor piercing shot was at one time soldered to the shot proper, as well as being crimped in a position in three places. Now, the actual bond required between these two bodies is only one sufficient to hold them together while they travel through the air. The purpose of the heavy, solid cap is to weaken the armor sufficiently to permit passage of the shot. The cap, on impact, fragmentizes, clearing the way for the shot to penetrate.

Solder served admirably in making a light bond between cap and shell. However, in view of the shortage of tin, lead and bismuth, it was considered an unnecessary luxury, particularly in view of the fact that crimping the shell around the cap in six places, instead of three served just as well. Along with saving 125,000 pounds of solder, per million shells, 40,000 man hours were also conserved.

A like conservation of metal and machining time was made by ordering for a high explosive shell, a slightly smaller band of copper than had previously been specified. This band, which fits more snugly than the body of the shell in the rifled barrel of the gun, serves to rotate the shot. Chevrolet engineers noticed that much metal was lost in turning the specified part down to size. By ordering a slightly smaller band, more than 65,000 pounds of copper per million shells was saved.

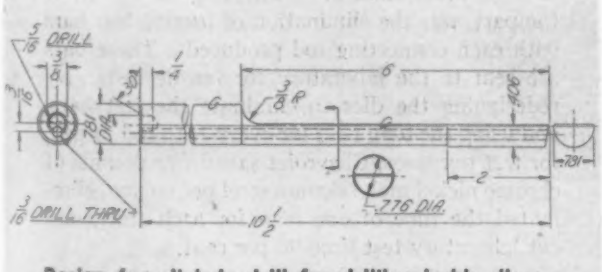
IMPROVED OIL HOLE DRILL

1. Improved cutting action.
2. Increased tool life.
3. 50% tool cost saving.

Achieved by STREAMLINED PRODUCTION

AMONG the hundreds of examples of speeding the job by improving cutting tool design, the development of an oil hole drill for an automatic screw machine job shows as well as any how the nooks and corners of a production job must be explored in a streamlining program.

In drilling valve tappet guides on a screw machine, the old way called for a high speed "oil hole twist drill."



Design for oil hole drill for drilling inside diameter of valve tappet guides on screw machines.

For drilling a valve tappet guide, the oil hole twist drill shown in the center was replaced by the straight drill at the right. Results: chips did not jam, tool cost was reduced by half.

Though the price was $10.00, there was an additional cost to be figured to the company in that the 25/32" size was not generally available in stock and lost production was a threat. More than this however, the particular job frequently caused the flutes to load with chips, choking down the oil flow until pressure was insufficient to dislodge them, and an overheated drill caused dulling. The job had to be held up for replacement or sharpening.

A new straight drill was designed and built from one inch high speed steel bar stock. The oil hole was enlarged. Improved cutting action was maintained over longer periods in that there were no flutes in which chips could foul. The drills were made in the plant at a cost of approximately one-half that of the drill previously used.

COMMON AND UNCOMMON SENSE

THE VALUE of small adjustments and construction of small jigs and fixtures which speed production cannot be overemphasized. In many instances, big assemblies are only a composition of numerous small parts. In any case, there is usually little value in developing faster methods for the big jobs if assembly must be held up for small production jobs. An interesting instance of common sense was shown in the adjustment of an operation on a small gear cluster. Where dogs of different lengths had to be bolted and unbolted on the fixture, to locate the gear variously for finish grinding, a telescoping dog, built for ready adjustment to the necessary stations, saved considerable set-up time.

Then there is an example of saving man hours by a simple pneumatic machine which pushes cylinder blocks along a conveyor toward the loading dock. A hinged dog at the end of a piston, stroking back and forth, catches the blocks as they come along on rollers, gives them a push along the way, disengaging itself at the end of the stroke.

A typical screw machine operation that was replaced by stamping on a not so vital press resulted in saving more than 50 per cent in labor, material and burden cost. Formerly, the rear wheel hub outer adjusting nut on

trucks was machined from solid bar stock. Specifications called for a hole and U-shaped rim machined in the slug. By forming from sheet steel, less material was used, a vital machine was released for other work.

Though big automotive plants have had available certain equipment and facilities not available to many plants, it has taken imagination of high order to convert much of the equipment, and it has taken diligence to discover it. Production planning and careful thought in allocating the big multi-purpose machines as well as regular equipment, to shops where they would be used to the best advantage has played an important part in the achievement.

ACHIEVEMENTS WITH SPECIAL TOOLING

THERE are hundreds of instances where the design of special machinery has speeded production, saved material, man-hours and critical machine hours. In many ways, viewing single instances of these developments cannot seem remarkable, for any one of them will appear to be what might have been done by anybody with the facilities which Chevrolet plants have at their disposal. Yet, the very number, and the tremendous savings effected, show the constant effort to find a better way. A few examples show the type of savings effected.

500% production increase: Where four single purpose lathes performed four operations on truck drive pinions at the rate of 25 pieces per hour, conversion of two Bullards to the job resulted in production of 125 pieces per hour.

Floor-to-floor time cut to one-twelfth: In milling the extractor pocket, key way and unlocked position stop on the breech ring of the 90-mm. gun, a horizontal boring mill required 12 hours for completion of the job, including laying out. A special mill designed by Chevrolet engineers reduced floor to floor time to one hour.

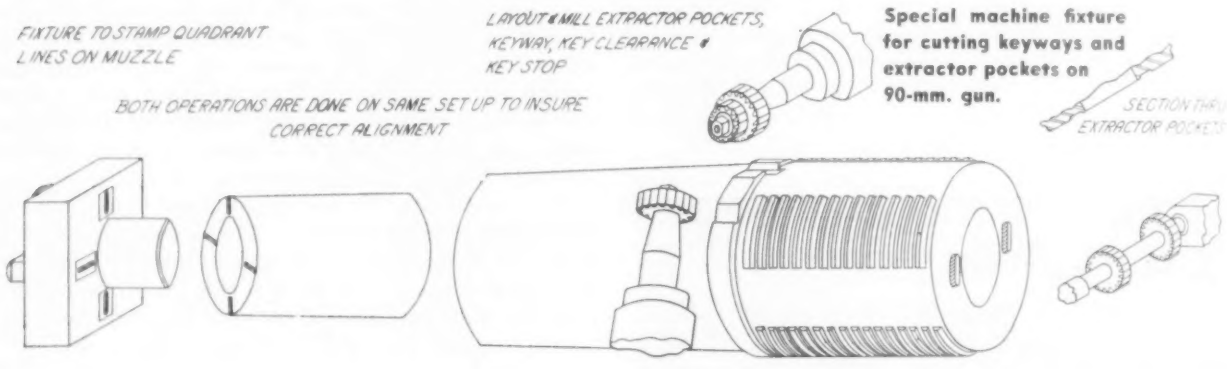
Increased production plus: In drilling, tapping, reaming and counterboring and the breech ring, separate jigs were used, requiring 12 set-ups, 12 man hours. Chevrolet designed and built a trunnion fixture for use with a radial drill which required but one set-up in the 8 hours necessary to finish the job. In addition to increased production and man hours savings, the single setup insured better location, and better alignment was possible between the radial drill and trunnion fixture.

A 100 per cent increase in production on drilling the center hole in a propeller shaft resulted from replacement of horizontal single spindle drills or standard radial drills by a 2-spindle, inverted deep-hole drill.

In forging blanks for the fixed reduction gear on the Pratt & Whitney engine, Chevrolet redesigned dies so as to reduce blank size 10 pounds. Bringing the shape closer to finished part dimensions, or nearer to overall dimensions, saved materials, man-hours, and machine time.

Another change in forging die design produced an altered design for a tank part but one equally serviceable. The purpose behind the change is shown in the resulting 50 per cent increase in die life.

Production time cut 75%: Where a fin on the breech ring assembly was removed in seven hours on a vertical slotting machine, with 8 hours required for hand finishing, Chevrolet built a die to remove the fin in an unused 50 ton hydraulic press. Total floor to floor press time was one hour, hand finishing was cut to three hours. A sizable capital investment saving also resulted.


FIXTURE TO STAMP QUADRANT LINES ON MUZZLE
LAYOUT & MILL EXTRACTOR POCKETS, KEYWAY, KEY CLEARANCE & KEY STOP
BOTH OPERATIONS ARE DONE ON SAME SET UP TO INSURE CORRECT ALIGNMENT
SECTION THRU EXTRACTOR POCKETS

Special machine fixture for cutting keyways and extractor pockets on 90-mm. gun.

MATERIALS SAVINGS

● Attention to production details and an eye on design requirements of parts produced in Chevrolet plants have resulted in tremendous materials savings. Following is a list of savings per 100,000 military vehicles.

CRUDE RUBBER	5,000,000 pounds
NICKEL	1,200,000 pounds
COPPER	500,000 pounds
CHROME	200,000 pounds
LATEX	125,000 pounds
TIN	70,000 pounds

Illustrating the methods employed in these savings, other than those affecting the design of the part, was the elimination of forging test bars with each connecting rod produced. These bars are sent to the laboratory for tensile tests. By redesigning the dies to eliminate the test bars, and using the tong hold for every 10th rod forged, for test purposes, Chevrolet saved five pounds of chrome nickel molybdenum steel per engine, eliminated the time of one man for each shift, and cut laboratory test time 90 per cent.

THE END

Calculating Screw Thread P. D.

WILLIAM T. TAYLOR

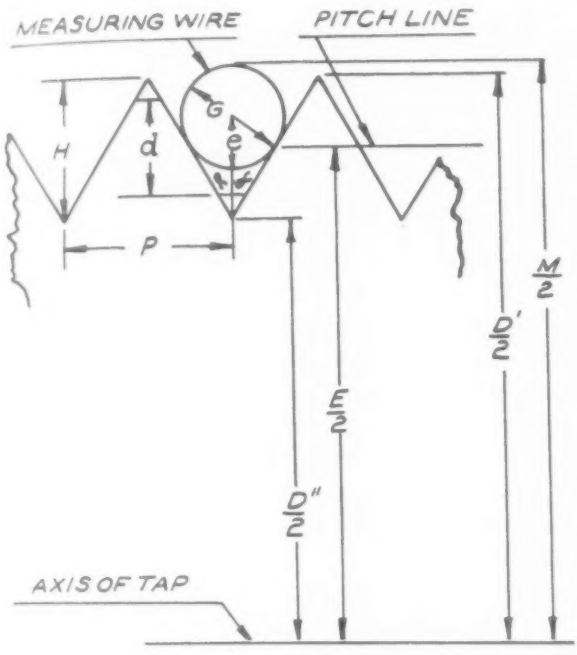
THE purpose of this article is (a) to simplify the general formulas for the over-wire (3-wire) dimension; (b) to present formulas in terms of basic pitch diameter; (c) to present formulas in terms of basic major diameter; (d) to show best wire sizes which may be used for any particular number of threads per inch; and (e) to show permissible plus-minus limits on the wire diameter for Whitworth 55° thread so that American wire sizes can be used to practical advantage.

Pitch diameter (P. D.) is one of the most important elements of a screw thread and it is the determining factor of the mechanical strength of a screw, since the strength of a screw thread depends not on its fit in the threaded hole (as is generally believed) but on the area of the flank contact of the threads and on the P. D.

There are two kinds of pitch diameter, namely: simple and compound. *Simple* pitch-diameter is taken at a line which passes through the threads at such points as to make equal the width of the threads and the width of the spaces. Simple pitch diameter and lead, or pitch for single thread, are the two most important elements — the more accurate the pitch, the more closely can the simple pitch-diameter approach normal.

Compound pitch-diameter occurs over a specified length of threads and is greater than the simple pitch-diameter by an amount due to error in pitch and/or error in angle of thread — this is the pitch-diameter commonly referred to. Limits on the simple pitch-diameter ensure that the usual errors do not impair the mechanical strength of the screw. Limits on the pitch diameter do impair the mechanical strength, but only very slightly; that is to say, to a maximum of about four per cent reduction over the full range from Class 1 to Class 4.

The importance of accuracy in the pitch diameter becomes evident in view of the fact that it determines the



Above:
FIGURE 1.
Diagrammatic sketch of axial one-wire measurement for the P.D. and the O.D. of even- and odd-fluted taps.

Where a measurement taken from the axis of a tap to any land can be relied upon, such a method may be used for measuring P.D. and O.D. without regard for the number of flutes it may have.

Right:
Elements of American 60° and Whitworth 55° Thread.

t.p.i.	P	d	.5773P	.8660P	d	.5637P	.824P	.5927P	.9158P	.5347P	.7322P
4.0	.2500	.16238	.14434	.21651	.1601	.14090	.20600	.14810	.23000	.13370	.18300
4.5	.2222	.14434	.12830	.19245	.1423	.12526	.18311	.13174	.20350	.18810	.16269
5.0	.2000	.12990	.11547	.17320	.1281	.11274	.16480	.11854	.18316	.10694	.14644
5.5	.1818	.11805	.10497	.15746	.1174	.10335	.15107	.10766	.16550	.09721	.13313
6.0	.1666	.10825	.09622	.14434	.1067	.09396	.13733	.09878	.15262	.09208	.12203
7	.1429	.09279	.08248	.12372	.0915	.08053	.11771	.08467	.13083	.07640	.11260
8	.1250	.08119	.07217	.10825	.0800	.07076	.10300	.07405	.11500	.06685	.08150
9	.1111	.07218	.06415	.09622	.0711	.06263	.09155	.06585	.10175	.05940	.08134
10	.1000	.06495	.05774	.08661	.0640	.05637	.08240	.05927	.09158	.05347	.07322
11	.0909	.05904	.05249	.07873	.0582	.05124	.07491	.05389	.08325	.04961	.06656
12	.0833	.05410	.04811	.07217	.0534	.04697	.06866	.04935	.07631	.04456	.06101
13	.0769	.04996	.04441	.06662	.0495	.04361	.06371	.04584	.07086	.04138	.05665
14	.0714	.04640	.04124	.06186	.0457	.04026	.05886	.04234	.06542	.03830	.05230
16	.0625	.04060	.03608	.05413	.0400	.03525	.05155	.03704	.05724	.03348	.04576
18	.0555	.03608	.03207	.04811	.0356	.03132	.04577	.03291	.05109	.02970	.04067
19	.0526	.03370	.03039	.04564	.0337	.02967	.04348	.03120	.04820	.02820	.03853
20	.0500	.03248	.02887	.04330	.0320	.02818	.04120	.02963	.04600	.02673	.03661
22	.0454	.02952	.02624	.03936	.0291	.02563	.03745	.02694	.04172	.02430	.03328
24	.0417	.02706	.02406	.03608	.0267	.02349	.03433	.02470	.03815	.02227	.03050
26	.0386	.02498	.02221	.03331	.0246	.02168	.03169	.02278	.03622	.02056	.02816
28	.0357	.02319	.02062	.03093	.0229	.02013	.02943	.02117	.03269	.01909	.02616
30	.0333	.02165	.01924	.02887	.0214	.01887	.02760	.02021	.03065	.01790	.02552
32	.0313	.02030	.01804	.02706	.0200	.01762	.02577	.01926	.02862	.01671	.02288
36	.0278	.01804	.01604	.02406	.0178	.01566	.02289	.01646	.02543	.01484	.02033
40	.0250	.01624	.01443	.02165	.0160	.01409	.02060	.01481	.02300	.01337	.01830
a	b	c	d'	e	f	g	h	i	j	k	l

b Pitch of thread.
d' Best wire size (Amer. Nat. 60° thread.)
f Form depth (Whitworth 55° thread.)
h Wire constant (Whitworth 55° thread.)
j Max. wire constant (Whit. 55° thread.)
l Min. wire constant (Whit. 55° thread.)
a Number of threads per inch.
c Form depth (Amer. Nat. 60° thread.)
e Wire constant (Amer. Nat. 60° thread.)
g Best wire size (Whitworth 55° thread.)
i Max. wire size (Whit. 55° thread.)
k Min. wire size (Whit. 55° thread.)

Simplified formulas and clarification of five factors pertaining to screw thread pitch diameters. Help in calculating and measuring this basic and important dimension is given in typical problems of even-flute tap design.

relative widths of the threads and the intervening spaces. Thus, if the pitch diameter of a tap is less than its normal value, the threads are thin, and if greater the threads are thick.

•

Screw thread specifications give the basic pitch diameter for *standard* sizes and pitch of thread; *special* screw threads are not included in the specifications, hence one of the first requirements is to compute the depth-of-thread constant, or

$$\begin{aligned} d &= .649519\ P \quad \text{(for the 60° thread form)} \\ &= .640327\ P \quad \text{(for the 55° thread form)} \end{aligned}$$

and the required basic pitch is

$$\begin{aligned} E &= D - .649519\ P \quad \text{(for the 60° thread form)} \\ &= D - .640327\ P \quad \text{(for the 55° thread form)} \end{aligned}$$

Example 1: Nominal diameter of a ½-inch-12 Amer. Nat. 60° Form is .5000 inch and the depth of thread is .649519 P. Determine the basic pitch diameter.

Answer: .5000 — .649519 P = .5000 — .649519 × .8333
= .5000 — .0541 = .4459 inch

Fundamental formulas for (m) given in Appendix 1 may be simplified to

$$m = E + (3.0\ G - \text{"V" depth } P)$$

hence $E = m - (3.0\ G - \text{"V" depth } P)$ for 60° thread (1)

$$m = E + (3.16568\ G - \text{"V" depth } P)$$

hence $E = m - (3.16568\ G - \text{"V" depth } P)$ for 55° thread

where

m = Dimension over the measuring wires
E = Basic (computed or measured) pitch diameter
P = Pitch = 1/n (where n = number of threads per inch)
G = Ideal "best wire" size = (P/2) Secant θ
= .57735 P for 60° thread form
= .5637 P for 55° thread form
D = Major (nominal) diameter
H = "V" depth = .8660 P for the 60° thread
= .960491 P for the 55° thread

In terms of pitch diameter, formula (1) reduced to its simplest form is

$$\begin{aligned} m &= E + .8660\ P \quad \text{(for the 60° thread form)} \\ &= E + .8240\ P \quad \text{(for the 55° thread form)} \quad (2) \end{aligned}$$

Example 2: What is the over-wire dimension (m) of a ¼-inch-NC-20 even-fluted tap whose basic pitch diameter is .2175 inch?

Answer: .2175 + .8660 × .05 = .2175 + .0433
= .2608 inch over-wire diameter

where

.8660 P = (3.0 G) — ("V" depth) P
= (3.0 × .57735) — (.8660) P = (1.732 — .8660) P
= .8660 P

Example 3: Assuming the actual over-wire measurement of a ¼-inch-NC-20 (max. 2 tolerance) precision ground-thread tap to be .2618 inch, what would be the pitch diameter?

Answer: .2618 — .0433 = .2185 inch max. pitch diam.

Example 4: Determine the over-wire (3-wire) dimension of a Whitworth ¼-inch-BSW-20 even-fluted tap whose effective (pitch) diameter is .2180 inch.

Answer: .2180 + .82399 × .05 = .2180 + .0412
= .2592 inch over-wire diameter

In terms of basic major diameter, formula (1) reduced to its simplest form is

$$\begin{aligned} m &= D + .2165\ P \quad \text{(for the 60° thread form)} \\ &= D + .1837\ P \quad \text{(for the 55° thread form)} \quad (3) \end{aligned}$$

where

.2165 P = (3.0 G) — (d + "V" depth) P
= (3.0 × .57735) — (.649519 + .8660) P
= (1.732 — 1.5155) P = .2165 P

Example 5: Without any knowledge of the form depth, and knowing only the major diameter, determine the over-wire dimension of a ¼-inch-NC-20 even-fluted tap.

Answer: .2500 + .2165 × .05 = .2500 + .010825
= .2608 inch (as before)

Example 6: In terms of major diameter (¼-inch), what is the over-wire dimension of a ¼-inch-BSW-20 even-fluted tap?

Answer: .2500 + .1837 P = .2500 + .1837 × .05
= .2500 + .009185 = .2592 inch (as before)

where

.1837 P = (3.16567 G) — (d + "V" depth) P
= (1.78449 — 1.6008) P = .18367 P

Example 7: Assuming the actual over-wire measurement to be .2602 inch (not .2592 inch) for a grade 1 ground-thread tap, determine the effective (pitch) diameter.

Answer: .2602 — .0412 = .2190 inch maximum effective pitch diameter

Large quantities of Whitworth 55° thread-form tools are being manufactured in this country and it is not uncommon practice to use American National wire sizes based on G = .57735 P.

Assuming the same pitch diameter, major diameter and "V" depth, the following thread elements are all different for these two thread-forms: the thread angle, the depth of thread and the basic pitch diameter. For example: using the Amer. Nat. "best wire" size for the Whitworth 55° thread, we get

m = E + (3.16567 × .57735) — (.960491) P
= E + (1.8277 — .960491) P = E + .8672 P = E + .0433
= .2180 + .0433 = .2613 inch over-wire diameter

But using a "best wire" size based on the Whitworth 55° thread form, we get

m = E + (3.16567 × .5637) — (.960491) P
= E + (1.78449 — .960491) P = E + .82399 P

E−.0412=.2180+.0412
.2592 inch over-wire diameter

or a difference of .2613−.2592=.0021 inch, due to using a wire size and constant for the Whit. 55° thread-form based on the Amer. Nat. 60° thread-form of the same pitch and nominal diameter.

•

The "ideal best wire" size referred to is based on the assumption that errors present in the thread angle should have no effect upon the measurement of pitch diameter and that the wires should rest in the thread groove so that they touch the flanks exactly on the pitch line. In actual practice, the size of wires does not conform exactly to each pitch and form of thread. Sufficient accuracy is obtained when the wires touch the flanks inside the middle fifth of their straight length; in other words, an allowance of plus or minus .029 P tolerance is allowed on the wire diameter, *i.e.*, .5637 plus .029 is .5927, and .5637 minus .029 is .5347.

It is possible to measure the effective diameter (P.D.) of taps by using wires which make contact anywhere down the straight portions of the flanks of the thread, provided due allowance is made for error present in the thread-angle. And in order that this error in the thread-angle have the least effect upon the measurement, perfectly round and straight wires should rest in the thread grooves so that they touch the flanks right on the pitch line.

Obviously, where the wires are so large in diameter that they touch the sides of the thread at (or close to) the major diameter, an appreciable error may occur; hence, certain definite tolerance on the wire diameter of the "ideal" best size is allowed.

For a perfect thread form the largest wire size which can be used would rest at the extreme upper ends of the straight portions of the flanks, whereas the limit of the smallest wire size is fixed by the necessity to stand out slightly above the adjacent crests of the thread.

For the Amer. Nat. 60° form the extreme maximum size of wire is very close to 1.0000 P, and the extreme minimum size is very close to .5100 P; for the Whit. 55° thread form the extreme maximum size of wire is .8500 P and the extreme minimum size of wire is very close to .5000 P.

For Amer. Nat. 60° thread, manufacturers in this country usually give extreme limits of .9000 P for maximum and .5600 P for minimum wire sizes; for Whit. 55° thread they place the extreme limits at .7600 P maximum and .5400 P minimum. For precision-ground thread, the wire sizes should preferably not exceed the values given in Table 1 for Whit. 55° thread, and (.57735 ± .043) P for Amer. Nat. 60°.

Example 7a: Give the limits of measuring wire diameters for Amer. Nat. 60° thread that may be used for measuring the pitch (effective) diameter of a ¼-inch-NC-20 even-fluted tap.

Answer: The "ideal" best wire size:
G=.57735 P=.57735×.05=.028867 inch.
The maximum best wire size:
G′=(.57735+.043) P=.62035 P
=.62035 ×.05=.03102 inch.
The minimum best wire size:
G″=(.57735−.043) P=.53453 P
=.53453×.05=.026726 inch.

Table 1 includes the thread elements, sizes for measuring wires, and corresponding wire constants for different numbers of threads per inch (t.p.i.) or pitch of thread. The permissible maximum and minimum Whitworth thread wire sizes with corresponding wire constants are given.

Formulas (2) and (3) are accurate for practically all sizes and pitch for single thread where the helix angle is no greater than six degrees.

Example 8: Using standard American wire-size, state whether .02887 inch (.0433 constant) diameter wires come within the maximum allowable Whitworth 55° thread wire-size for 20-t.p.i.

Answer: Yes. The maximum permissible wire-size plus limit for a Whitworth 55° 20-t.p.i. thread is .02963 inch, and the corresponding wire constant is .0460 inch.

Example 9: Using standard American wire-size, state whether .02624 inch (.03936 constant) diameter wires come within the minimum allowable Whitworth 55° thread wire-size for 20-t.p.i.

Answer: Yes. The minimum permissible wire-size minus limit for a Whitworth 55° 20-t.p.i. thread is .02673 inch, and the corresponding wire constant is .03661 inch. (The American wire size .02624 inch corresponds to the "best wire" size for 22-t.p.i. Amer. Nat. 60° thread form).

Where a measurement from the axis of a tap to any land can be relied upon, such a method of measurement may be used for obtaining the over-wire dimension and P. D. of the tap. We are justified in assuming that where a blank tap can be centered, the thread cut (or ground), then chamfered, with the dead-center position left unchanged during these stressed operations, there is every reason to believe that the same dead-center axial position can be relied upon and the one-wire axial over-wire and P. D. measurements used.

Figure 1 shows this method of measurement, using one measuring wire, and it indicates the thread elements referred to in the text.

APPENDIX 1.

In terms of basic pitch diameter (E) the fundamental formula for over-wire dimension (m) is

$$m = E + (1 + \textit{cosecant}\ \theta \times P/2\ \textit{secant}\ \theta) - (\textit{cotangent}\ \theta 2n) \ldots$$

And in terms of basic major diameter (D) the fundamental formula for over-wire dimension (m) is

$$m = D + (1 + \textit{cosecant}\ \theta \times P/2\ \textit{secant}\ \theta) - (d + \textit{cotangent}\ \theta 2n) \ldots$$

THE END.

This article, dealing with even-fluted taps, is the first of two. A second feature by the same author, concerned with measuring and calculating P.D. of odd-fluted taps will appear in an early issue of THE TOOL ENGINEER.

Production Control Today Has Post-War Aspects

● According to George H. Trundle, Jr., noted industrial engineer, production control is a tool of management which used properly today can spell the difference between post-war failure and success. Survival in many plants may depend upon improved manufacturing sequence. Turn to page 107 of this issue of THE TOOL ENGINEER for a complete exposition of Mr. Trundle's ideas on this subject.

PLANT LAYOUT

Within the dimensions of length, width, height and time, this third and last installment considers a variety of problems. These include accumulation areas for parts in the event of breakdown; materials handling; and disposition of machines and their accessories.

A. E. RYLANDER
TECHNICAL EDITOR

Concluding article of a series

●

As previously stated, good plant layout presumes an easy, progressive flow of work in process from receiving to shipping.

However, there will be occasional interruptions — as from breakdowns and other causes—in even the best laid plans. Hence, there must be provided diversions in addition to accumulation areas.

For example, an automatic or special purpose machine may be interposed between slower manual operations requiring considerable space and comparatively large operating crews. Should the machine fail, and be laid up for repairs, production would be arrested at that point unless provision had been made for taking up the slack.

Now, automatic machines are designed to cut time and costs (synonymous terms in manufacture), so the equally obvious alternative is to shunt the operation involved to conventional machines which may be remotely situated or which may be brought to the spot. In either event, it is evident that several machines would be needed to temporarily replace the one.

Therefore, any key machine, the failure of which might create a bottleneck, should not only be situated near a trucking aisle, but should have space enough around it for placement of relief equipment and for accumulation of stock in process. See Figure 1.

In plant layout, one is often confronted with the problem of machine disposition, as whether to segregate them into departments or in relation to operations. Both methods have their advantages, although segregation is almost arbitrary with the general run of machine tools.

For example, production millers, gear cutters, turret lathes, automatics, grinders and so on are best disposed in groups or in separate departments, depending on the size of the plant. So, for that matter, are punch presses, welders and hydraulic riveters, although the latter may be considered as semi-portable tools.

There are valid reasons for segregation entirely outside of custom. In the case of automatics, one operator would run several machines while, inversely, several hand operated machines may be set up for the same job. Here, the advantage of segregation lies largely in service and proximity to a common tool crib.

With press work, parts in process may have to pass from press to press blanking, piercing, forming and so on—all of which favors segregation. Welders would have to be shielded, and ventilation provided; here, too, generators may be advantageously disposed on balconies, saving valuable floor space. The same holds true for hydraulic riveter pumps. See Figure 2 for practical disposition of such equipment as generators and pumps. Note that the units are disposed on balconies which may be mounted on building columns.

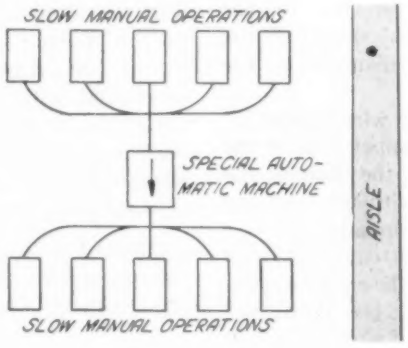


FIGURE 1.

Where an automatic or special-purpose machine would create a bottleneck because of breakdown or failure, provide sufficient area for stock accumulation or placement of temporary equipment.

Here, however, several precautions:—(1) If units cannot be mounted or dismounted by means of a traveling crane, install a tramrail, running parallel with the platform, and provide it with a hoist of sufficient capacity to lift the heaviest unit. Also, make the platforms wide enough so that servicemen may work around the equipment in safety.

With hydraulic equipment, it is well to provide shut-off valves, both from the pumps and floor units, and, as a further precaution, a sump into which oil may be drained and saved in case of service.

At the other extreme, machines are sometimes moved to the job, especially when the work is so heavy that the machine becomes the more portable unit. Such procedure is not uncommon in heavy machine tool manufacture, and, on certain operations on tanks and heavy ordnance equipment, may be the rule rather than the exception. It all boils down to expedience; do the job the best and the least costly way.

One may, however, advantageously dispose miscellaneous equipment so that work will flow smoothly and without roundabout detours. For example, a product which goes through various stages of assembly, and which becomes heavier and more cumbersome, may well be processed with fixed as well as portable tools.

Take, for instance, the assembly shown in Figure 3, and which is shown schematically in its various stages of manufacture. The several components, such as steel stampings and welded sub-assemblies, are each subjected to various processes, some of which imply accurate machining. There may even be stress annealing, to neutralize distortion, and final welded assembly which in turn results in distortion and which must be stress annealed.

Hence, there will be corrective operations as the work proceeds. Typical manufacturing operations are shown in Figure 4. Here, however, a note of explanation: bear in mind that practically all of the illustrations for this article are schematic and intended to convey ideas for the flow of material.

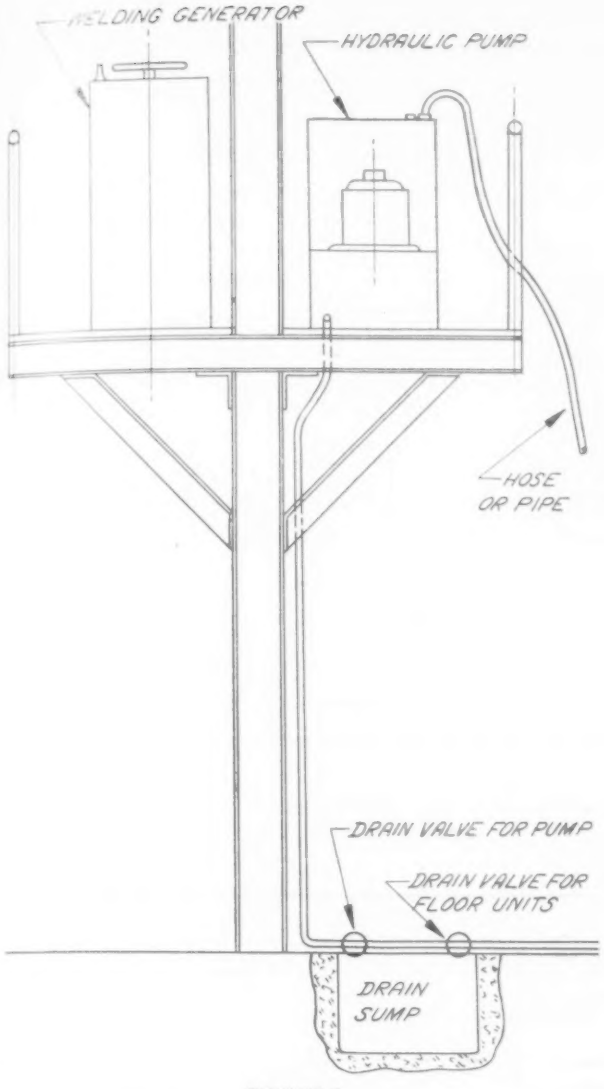


FIGURE 2.

Balconies for welders and pumps.

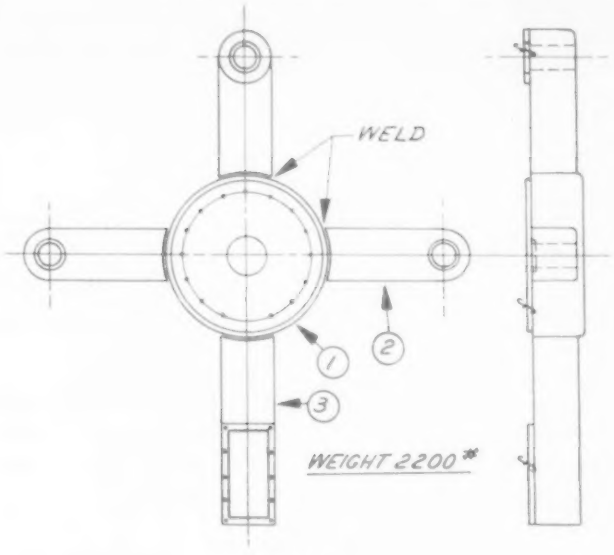


FIGURE 3.

SEQUENCE OF OPERATIONS

1. Prefabricate components, Dets. No. 1, 2, 3.
2. Rough machine Dets. No. 2, 3.
3. Assemble all components and weld into unit.
4. Stress anneal assembly. Special carriages and cooling racks.
5. Finish all top surfaces. Planer, pre-loading fixture.
6. Bore center hole. Radial drill; fixture.
7. Finish bore, c'bore, chamfer, etc., three holes on arms. Special machine.
8. Drill and tap 16 holes, center. Multi-drill, plate fixture.
9. Drill and tap 12 holes on arm. Multi-drill, plate fixture.
10. Inspect.
11. Paint.

Hence, details are omitted.

Coming back to machine segregation, typical layouts are shown in diagram in Figures 5, 5A, 5B, 5C and 5D. The first is a plant diagram embracing the general run of machine tools, with suggested flow of material.

Figure 5A shows diagonal installation of screw machines and automatics, the staggered layout permitting clearance for bar stock together with convenient racking of bars. Racks should be disposed so that the machine can be fed with the least possible time and effort. Figure 5B shows a good installation of gear cutters, arranged in batteries of three —or as many as the manufacturer recommends per operator—on either side of a common work aisle. This aisle communicates with a main trucking aisle, also, with a narrower aisle between machines and work benches.

Figure 5C shows disposition of production millers. Note that machines are not set in line, back to back, but staggered to provide clearance for receding overhead arms. Note, also, the wide spacing between machines; this is to provide room for tote boxes, one next to the trucking aisle, two between machines. That way, material is easily brought to the machines and removed as finished. The trucker, in replenishing supply, first removes the finished stock, moves the empty tote box in its place and replaces the latter with fresh supply. The machine aisleway is wide enough so that operators may work back to back without interference, this also providing room for truck passage between main aisles.

While all of the foregoing may seem elementary to the veterans, it is shown and described because of its educational value to those unfamiliar with plant layout. And these days, education is a vital necessity. However, Figure 5D portends some discussion pro and con, with the writer contending for the method shown. By conventional practice, work benches are placed alongside building walls, with workers facing the windows. That method is wrong, argue it as you will. For proof, work a while with the light in your eyes, then start looking at a drawing or a wall chart. It takes time for the eyes to focus.

If, however, benches are placed at right angles to the wall, the operator can not only have what light he needs — as for sight gaging — but works without undue eye strain. A dividing screen is set up in the middle of the bench; this protects the opposite worker from flying chips. This installation deserves thought.

One thing, not generally considered,

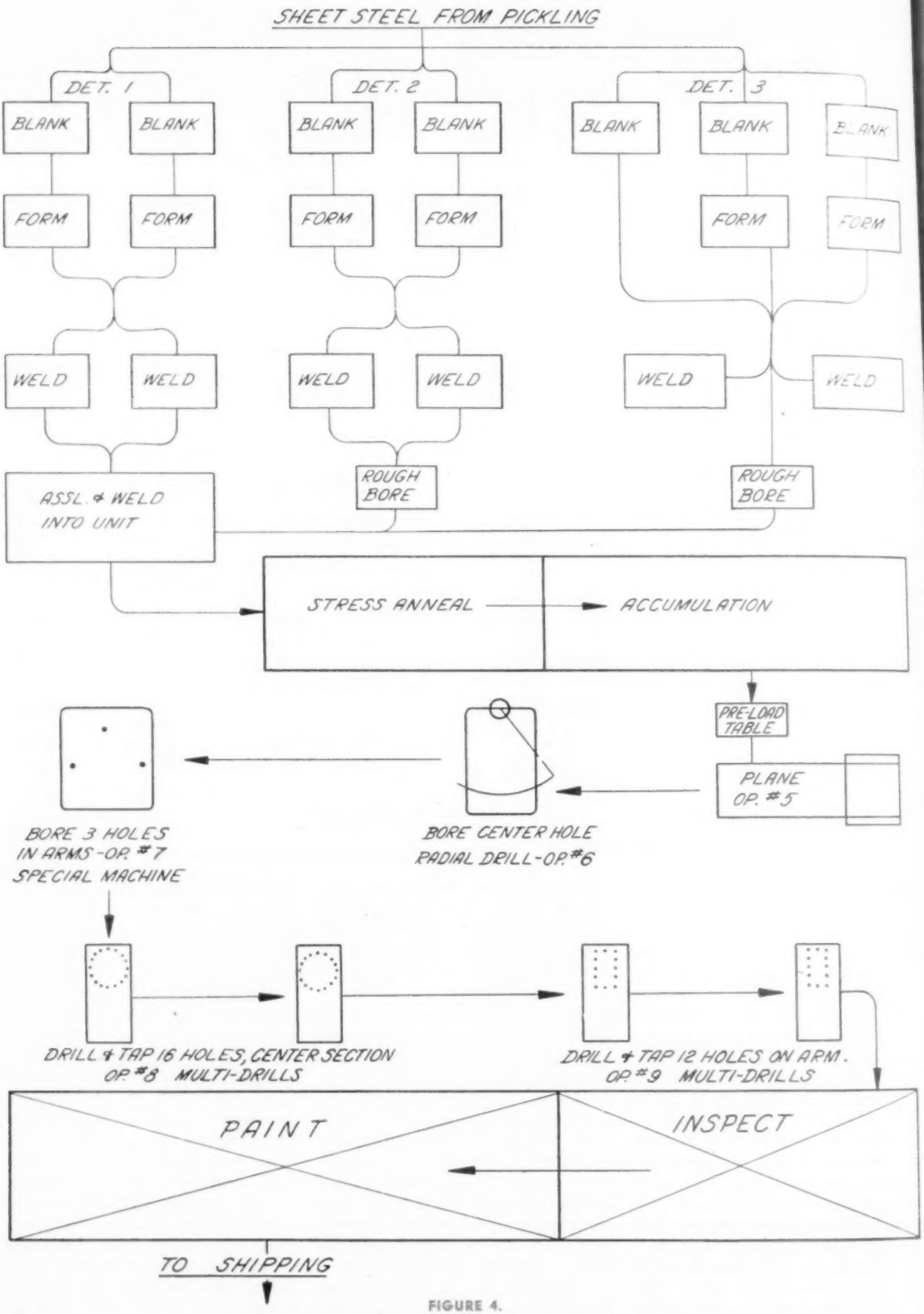


FIGURE 4.

Schematic layout to illustrate the various stages which occur in processing the parts composing the assembly shown in Figure 3.

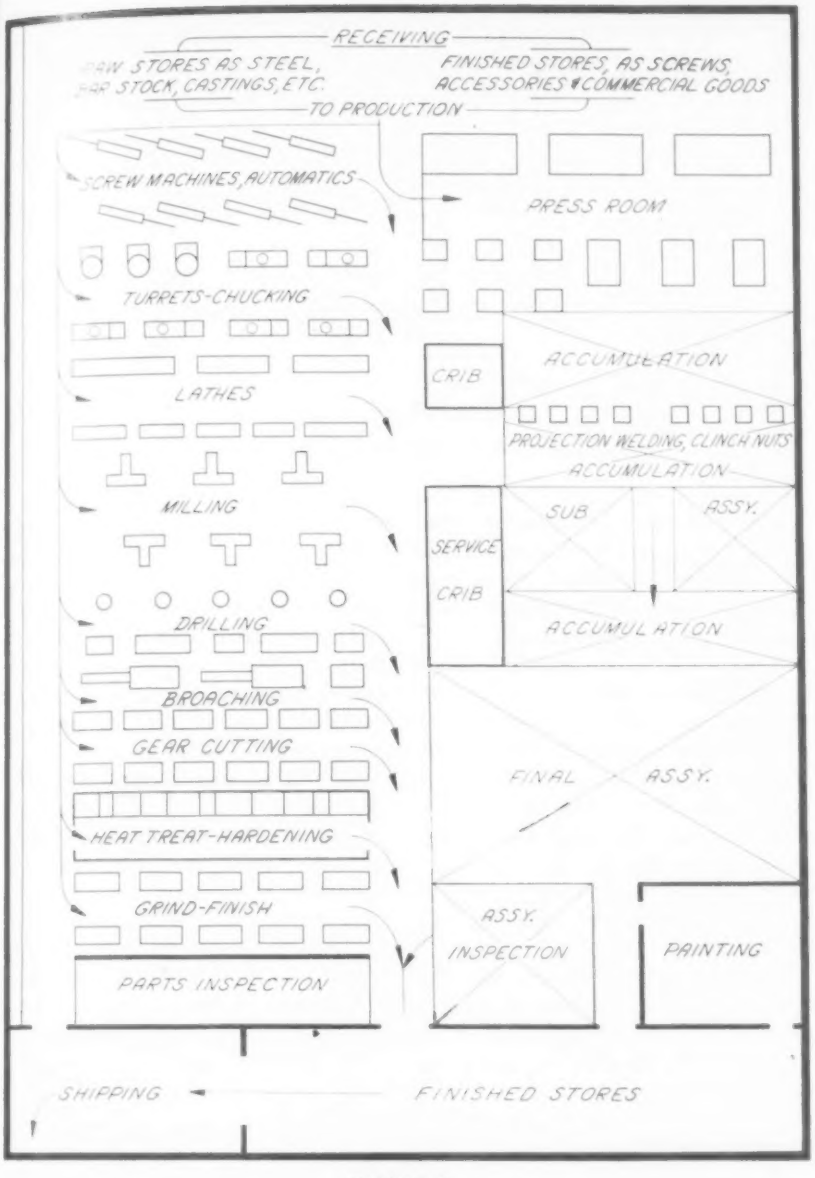


FIGURE 5.

Representation of the flow of materials in the manufacturing processes—such as turning and chucking, broaching, gear cutting, and so forth. Hardening is interposed between metal cutting and grinding and finishing. Parts in process can be moved directly to the next "department" or be diverted as required.

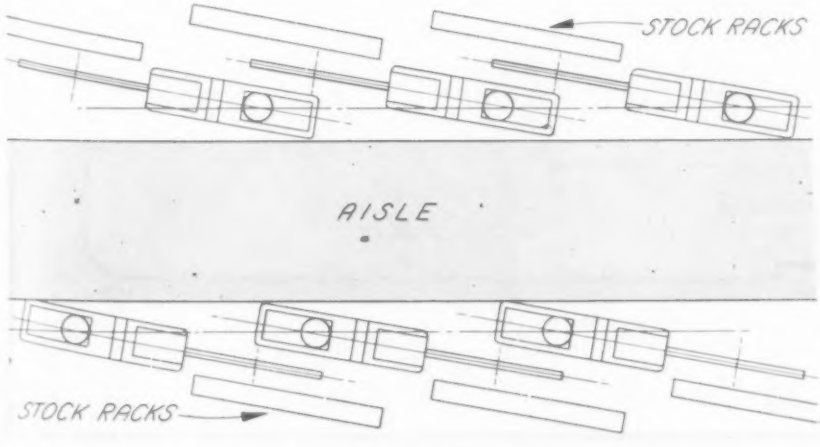


FIGURE 5-a. Layout for screw machines.

is that plant layout has a direct relationship to production planning and routing. Poor layout can be a perpetual headache to the production manager, creating confusion in handling and disposal of material. Therefore, there should be close cooperation and coordination between plant engineering and production.

And while, as previously implied, an ideal condition is not usually achievable, one can always make the best of limitations and settle on a fairly satisfactory compromise. Yet, bear this in mind, that the bugs in a layout should show up on paper, and that it is always easier to erase a line than to tear down steel once erected.

In the final analysis, plant layout is predicted on four dimensions — length, width, height and time. To these one can add a fifth by including

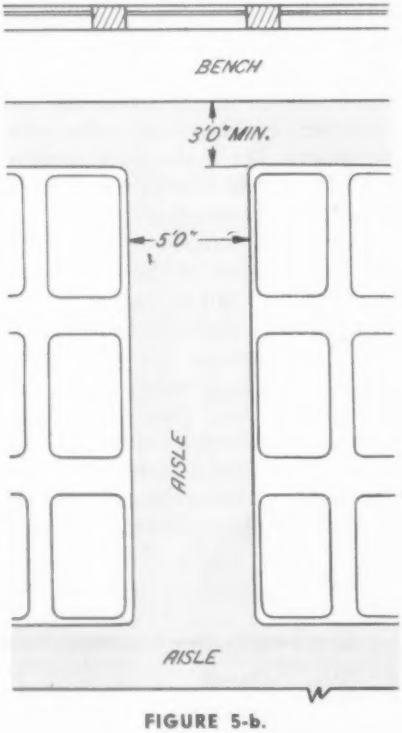
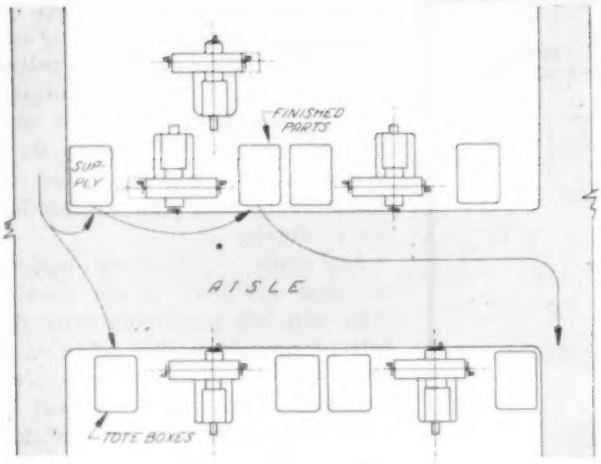


FIGURE 5-b.

Layout for gear cutters.

depth, which, in this case, doesn't necessarily mean the same thing as height. A conveyor, for example, may feed a section at floor level, may then ascend to an upper floor and return through a trench. Or, trucks may pass from building to building via overhead bridges or through tunnels. Or, again, "through" trucking aisles may be provided, with grade separations much after the manner of modern superhighway planning. Personally, I haven't seen any such installation, but it will come if not already here.



Left:
FIGURE 5-c.
Layout for millers.

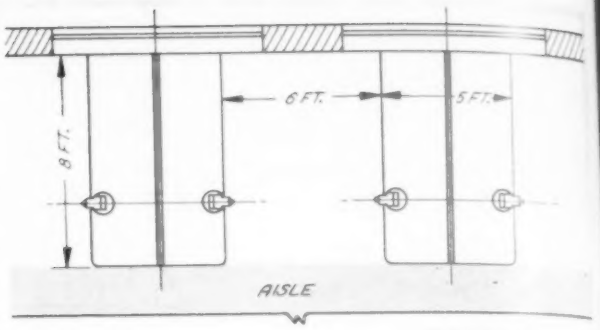


FIGURE 5-d.
Layout for work benches.

Trucking, of course, comes under the head of materials handling, and while this is coincidental to plant layout it is a subject in itself and will be so treated in a later article. As directly related to plant layout, however, the following points must be carefully considered: (1) safety, (2) elimination of interferences, and (3) convenience. There are other considerations, but if the three cardinal points are taken care of the rest will follow as a matter of course.

Safety is of paramount importance, not only because of the human element involved, but because of its consequences to equipment and product. In this connection, the writer once saw an expensive, multi-cylinder engine irretrievably damaged because an overhead tramrail collapsed.

By eliminating interferences, and designing for convenience, one gets speed as well. And speed resolves itself into reduced costs. For example, one of the headaches of materials handling is the "leapfrogging" that results from crane lifts. Unless a clear center aisle is provided, loads must be moved over floor equipment and machinery and the operators.

Since the latter are usually required to "move from under" it means not only the momentary stoppage of work but the tension entailed of being constantly on the alert. Even with a center aisle there is hazard of a sort, so, everything considered, the crane is a highly essential tool but a necessary evil regardless. It can well be supplemented with conveyor systems and shop trucks.

So far, we've largely been concerned with the three conventional dimensions—length, width and height. Let us now briefly consider the dimension of time. For instance, it takes time to move raw material from receiving stores to the points of process. And time is money. If, now, we so dispose the various operations that the least possible moving is entailed, we naturally cut time. This element has been considered in the previous installments, but repetition may not be amiss. Review, for example, the balconied building plan shown in the first installment of this series, where lighter manufacturing operations were performed in balconied ells adjacent to the main craneway.

If, now, we were to do all the lighter machine work on an upper story, and if the main floor were devoted entirely to heavy machine work and assemblies, we could "drop" all machined parts and sub-assemblies almost at the point of installation with a minimum of space, time and effort.

Compare the typical layout shown in Figure 6 with the conventional diagrams of Figure 5. While the latter show nice discernment and imply orderly routing and processing, the simpler layout of Figure 6 has everything in its favor—if it can be applied to your problems. But that is for you to decide. THE END.

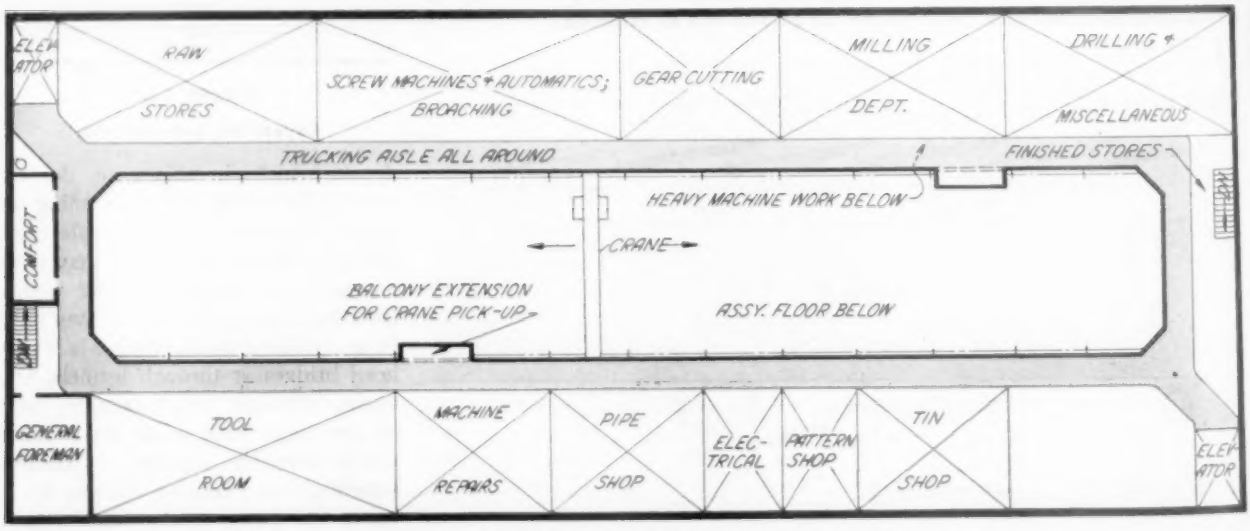


FIGURE 6. Schematic suggestion for balconied layout.

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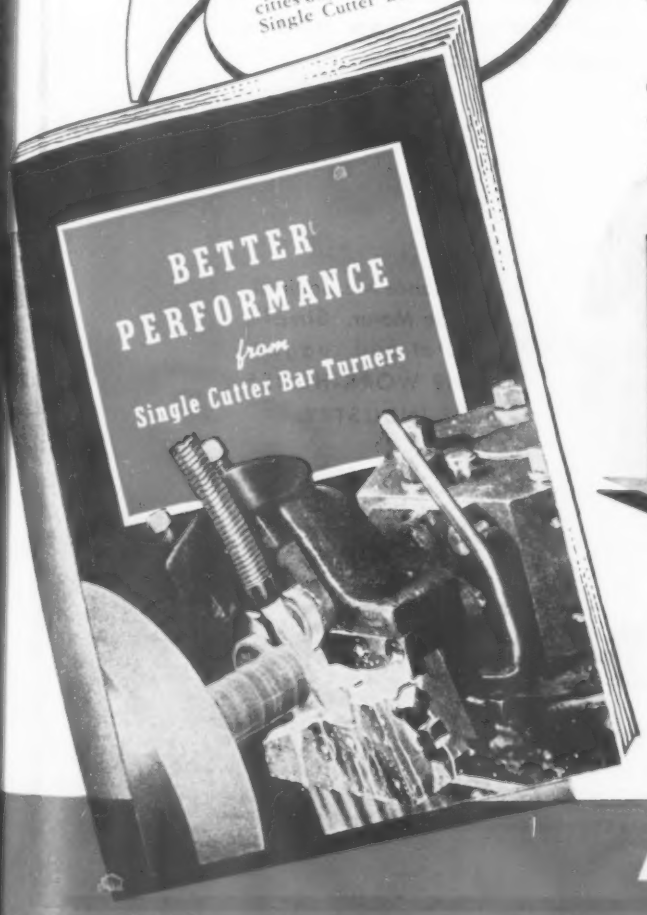

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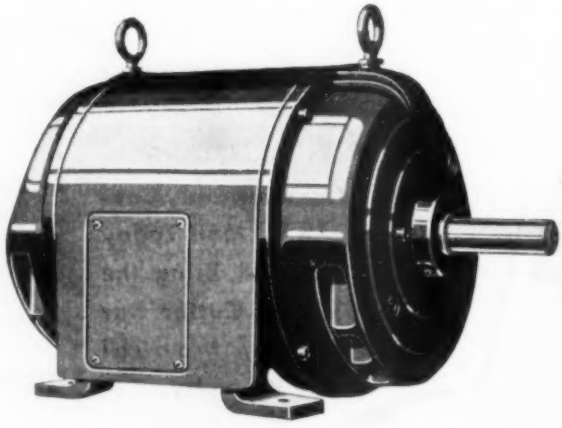

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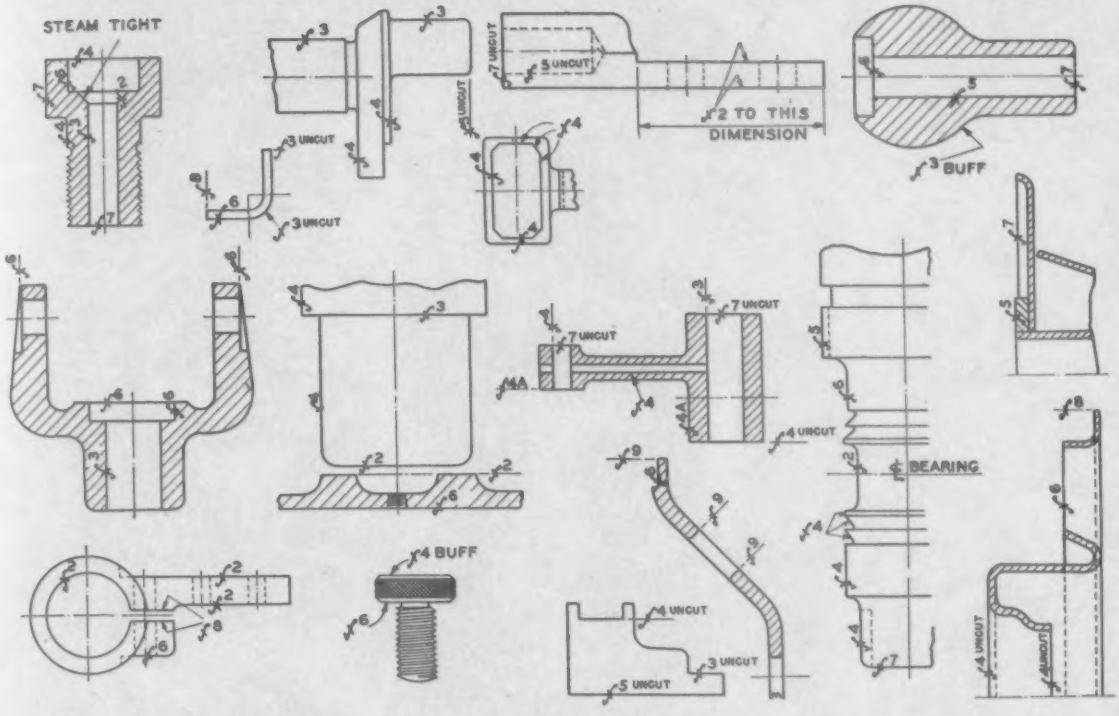
PRODUCTION DATA SHEET

SURFACE FINISH DESIGNATIONS



FINISHED SURFACES

Finish Symbol ***	Typical Methods of Producing (does not include all methods)	Approx. Rel. Cost (See Note 4)
*f*1	Generally hardened, ground, lapped and/or honed.	100
*f*2	Ground or turned surface, lapped to eliminate tool marks or die cast, molded, drawn or extruded, etc.	90
*f*3	Fine ground, turned, scraped, burnished, planished, reamed, etc., or die cast, coined, molded, punched, drawn, etc.	50
*f*3½	Finish ground, turned, reamed or scraped or die cast, coined, molded, punched, drawn, etc.	40
*f*4	Any machine tool using light cut or die cast, molded, punched, forged, drawn, etc.	30
*f*5	Light finish tool cut, medium ground, filed, profiled, planished, broached, counterbored, spot faced, etc., or die cast, molded, punched, sand cast, forged, drawn, etc.	20
*f*6	Finish tool cut, medium ground, filed, planished, drilled, profiled, counterbored, spot faced, etc., or forged, molded, die cast, sand cast, etc.	15
*f*6½	Tool cut, rough ground, turned, drilled, filed, sawed, counterbored, etc., or forged, molded, die cast, sand cast, punched, etc.	10
*f*7	Tool cut, rough ground, sawed, blanked, nibbled, rolled, flame cut, etc., or forged, molded, die cast, sand cast, etc.	5
*f*8	Rough tool cut, parting cut, sawed, sheared, flame cut, nibbled, etc., or forged, molded, sand cast, punched, etc.	3
*f*9	Flame cut, sheared, chipped, rough forged, etc., rougher than *f*8, but not more than twice as rough.	1

SPECIAL PURPOSE SURFACES

The term "special purpose surface" is used where the resultant surface is a standardized basic surface plus an extra operation or processing, or when the basic surface is a part of a specially prescribed process. For example:

*f*4	S.I. 1196	Special information is specified by supplementary instructions.
*f*7	MACHINE FLAME CUT	Where engineering instructions, for specific and warranted reasons, restrict the method of obtaining the required finish to one way or to one process.
*f*4	UNCUT ■	
*f*3	POLISH	Extra operations or finishes made on the same basic surface.
*f*3	BUFF	
*f*3	MIRROR	
*f*3	SCRAPED	
*f*7	PAINT	Where the ultimate purpose of the surface is given to obtain the basic surface at least cost.

*** NOTES

NOTE 1. Quality of the finished surface described by the finish symbol if defined by approved, prepared specimen pieces.

NOTE 2. Surface specimens represent the roughest surface acceptable under each "*f*" number, regardless of method or material used on the finished product. Finer surfaces are acceptable if made at no extra cost except when a particular characteristic of a surface is specified.

NOTE 3. All comparisons to be made by visual and feel methods.

NOTE 4. Relative cost of different surfaces depends on the quantities, the material, methods, and machines involved.

■ Where "uncut" is used with the "*f*" number, it is to be interpreted that the specified degree of smoothness is to be obtained in the process of molding, casting, forging, punching, etc.

● A need exists for a rapid and reliable method to designate machined surface finishes. The above chart is used by the General Electric Company. Drawings show how to indicate the desired finish. Though this system may not prove 100 per cent applicable, it does provide a fairly broad standard. Specimens should be used with it to show the definite surface values, in that gaging the finish depends upon feel and vision. Two or more specimens may represent one symbol, as for example, to show the finish obtainable by honing and by lapping. Roughness ranges from 4 to 2000 micro-inches.

NOTE: On this page is the twenty-second of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

THE CRIB

T. M. REG. U. S. PAT. OFF.

IDEAS · KINKS · SHORT CUTS

Multiplying the Gripping Power of Air Cylinders

In the production of primer percussion tubes, the operations of spinning, counterboring and tapping require tight gripping so that the tubes will not turn in the chuck during machining operations. To acquire this power direct required air cylinders of large proportion which were cumbersome and expensive.

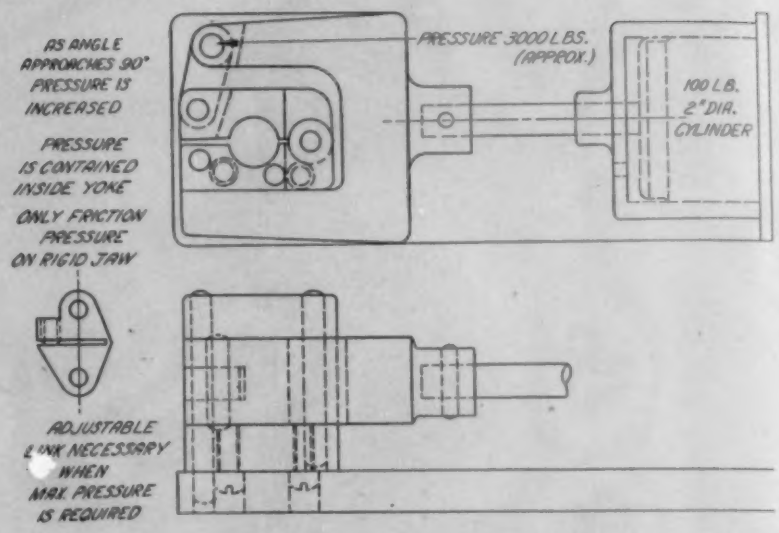
Pressure required to grip these tubes for the spinning operation called for a 6-inch cylinder at 100 pounds per square inch air pressure. For the Number 2 Warner & Swasey which was used for this job, this size cylinder with chuck was too heavy.

A method was devised for overcoming these objections, yet which furnished the gripping power required. It avoided exerting all the pressure against the rigid jaw which had a tendency to be pushed off position or at least to spring to some extent.

With the arrangement shown in the drawing, only about 1/10th of the pressure required for gripping is exerted against the rigid jaw, as a yoke of proper proportion spans the chuck and the pressure is exerted on the yoke instead of the jaw. Only the friction, plus 1/10th of the gripping power of the sliding member of the yoke has any influence on the rigid side of the chuck.

Six of these jigs for spinning, tapping and counterboring have been built at a cost of one-third that which would have been needed to equip them with cylinders large enough to grip the tubes directly.

An adjustable link is shown which was found particularly useful on the spinning operation. In that this required the hardest grip, the link holes and pins wore rapidly, and it was necessary to replace the solid links about every 20,000 pieces. The adjustable link has eliminated this trouble and is good for about 150,000 operations.


AS ANGLE APPROACHES 90° PRESSURE IS INCREASED
PRESSURE IS CONTAINED INSIDE YOKE
ONLY FRICTION PRESSURE ON RIGID JAW
PRESSURE 3000 LBS. (APPROX.)
100 LB. 2" DIA. CYLINDER
ADJUSTABLE LINK NECESSARY WHEN MAX. PRESSURE IS REQUIRED

Reducing Noise In Screw Machines

An original idea from Charles J. Daley, of the Bronx, New York, who is employed in the shops of the Interborough Rapid Transit Company, concerns eliminating noise encountered in running bar stock through the bar tube of turret lathes and screw machines—be they round, square, hexagon or odd shapes.

Daley tried springs, felt washers, rubber and leather, but all worked loose in short order. He then tied a piece of oily waste on the end of the bar and pushed it into the tube and chuck. Fifty per cent of the noise was eliminated. Taking the bar out, he tied another piece of waste 5 feet from the end, and absolute quiet was the result.

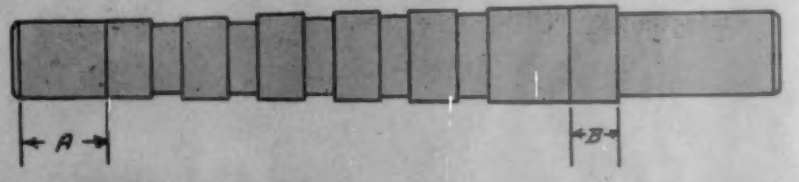
Final adjustments included the use of cloths with a piece of string on one end of the cloth tied counterclockwise on the bars. Final results are 99-9/10ths quiet, and considerably improved shop working conditions.

Combination Broaching and Burnishing Tool

The sketch shows the design of a tool which is used for broaching and burnishing holes in small duralumin gear blanks. In the process of making broaches of the conventional type, a lazy man's idea prompted a trial of this tool, which is ground with a continuous taper over the working length instead of being stepped from tooth to tooth. The backing off of the teeth has also been eliminated. A trial of this tool gave surprising results, the hole produced being exact to size and highly polished.

The section A is ground to a diameter to fit the drilled hole; the section B is ground to the finished diameter, while the toothed section is ground to a continuous taper. This produces a series of teeth with negative clearance. As the cutting edge of each tooth is slightly larger in diameter than the back end of the preceding tooth, a thin chip is produced by each tooth, and the metal is burnished by the tapered section between each tooth.

In the case in question, holes of ¼ and ⅜ inch diameter were broached by inserting the end of the tool into the drilled hole, and driving it through in a punch press, the relieved section at the upper end permitting the tool to drop through.



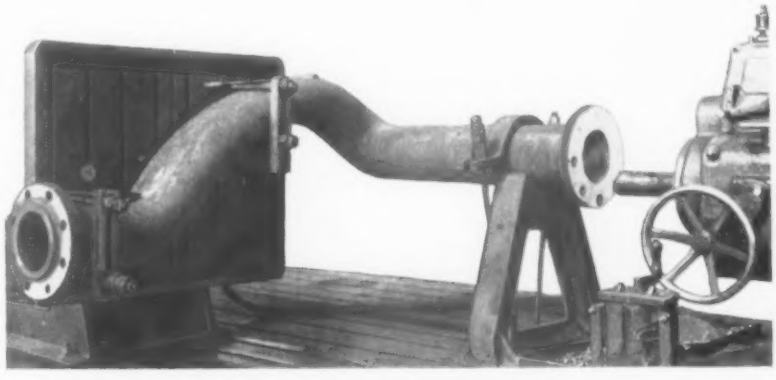
LAYING OUT HEAVY WORK

The experience of railroad shops can be of help to war production engineers who are not accustomed to handling heavy workpieces. Here are typical problems and practical solutions used by an engineer in a railroad shop.

METHODS used in the railroad shop cover a great variety of heavy work, because locomotives are complete power plants, developed during a century of experience. The procedure of laying out and erecting locomotive parts may be studied to advantage and the methods often transferred, with slight modifications, to such other fields as ordnance work or ship building, and in some instances to automotive or aircraft manufacture. Conversely, many modern railroad shop practices had their origin in the automotive field. The men working in one of these branches of mechanical work know surprisingly little about the others, and the exchange of ideas in these divergent fields has been indirect.

Some knowledge of geometry and trigonometry is a great help in laying out machine parts. It is necessary to know how to square a line (erect a perpendicular) by geometrical methods and some of the other propositions of high school geometry. A knowledge of the trade is of course the most essential thing and in order to read blueprints it is necessary to know engineering drawing. Descriptive geometry as taught in engineering courses is a help, but in spite of recent efforts to make text books with a shop flavor there is still a wide gulf between theory and practice.

Some confusion exists as to which side of an object should be shown in the three views of orthographic projection and there are many prints with the projected views turned the wrong way and one using blue prints should be on the look out for oil holes and other clues that will indicate the top and bottom of the object depicted. This subject of "third angle projection" is explained in texts on drawing. A handy rule to remember in reading prints is that the surface shown should be the adjacent surface in reference to the other view. Another way of putting it is the top view of an object should be placed above the elevation (side view), and the end of it on the observer's left (in the elevation) should be placed to the observer's left when reading the drawing. A number of older drawings are turned the other way and in England drawings are said to be turned either way.



Drilling and facing a steam pipe on horizontal boring mill.

Machining Operation on a Locomotive Part

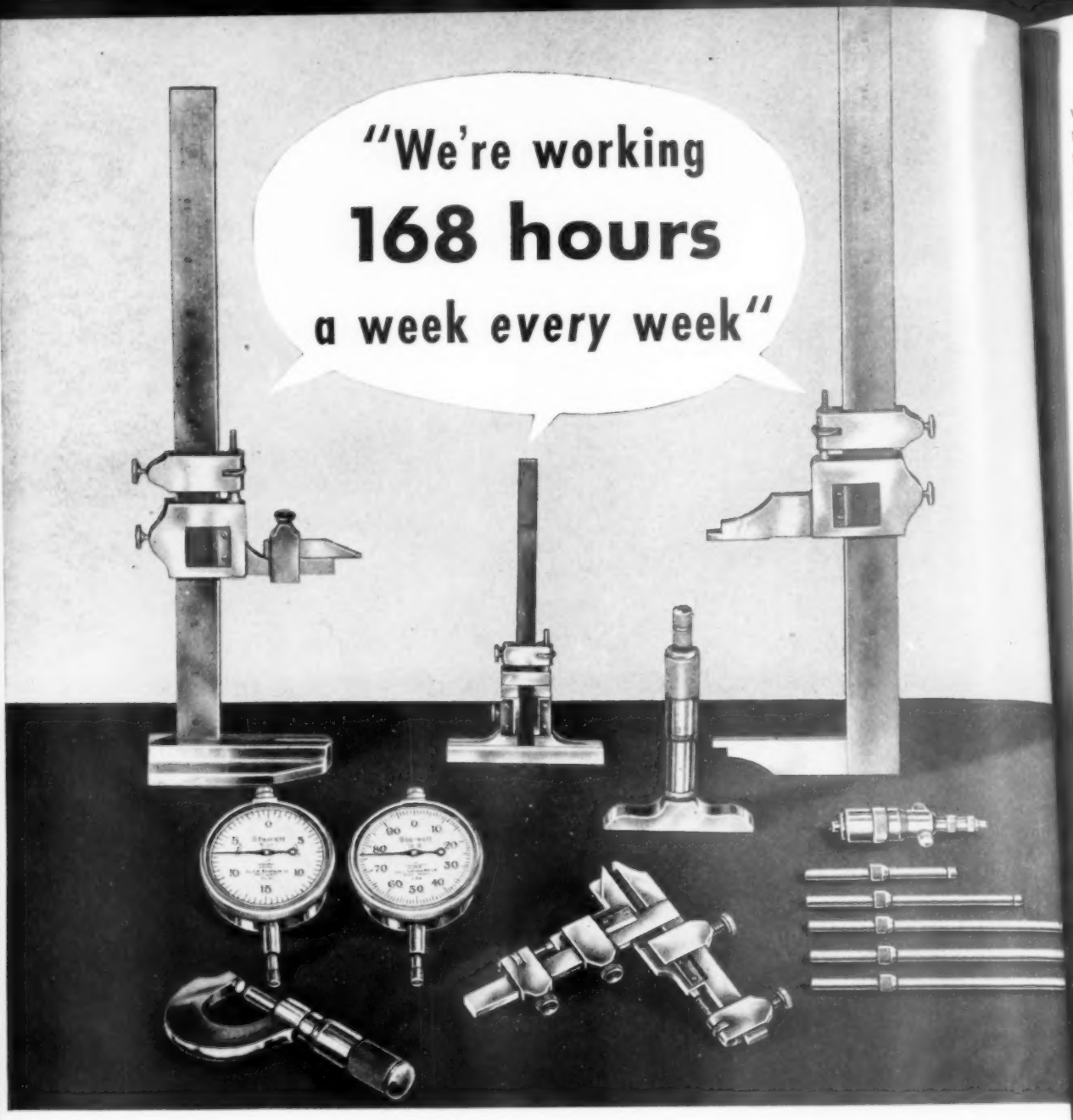
Machining a back valve head, with guides for the valve crosshead cast integral: Horizontal boring mill—the stuffing box hole is bored and seats faced. Lathe—the casting is mounted through the valve stem hole on a threaded mandrel, and is braced and clamped for heavy cuts. Planer—previously machined surface is clamped against a face plate and guides are planed square and in line with the hole in the head. A special tool undercuts guide surfaces. Holes in the head are laid out in relation to guide surfaces by leveling up the head on a face plate and quartering the stud surface.

SPACING HOLES ON A CIRCLE

Spacing holes on a circle is such a frequent job in connection with cylinder heads, pipe flanges, and ordnance work, that it deserves special attention. There are some tool room methods for dividing circles with great accuracy, but these are time killers and not readily applicable to heavy work. By the careful use of dividers and trammel points and ordinary scale measurement the error may be kept down to plus or minus .007 provided an accurate method is utilized to locate the drill and keep it from running over. This can be done with a jig bushing pressed in a small block and clamped over the hole to be drilled. The jig is located by a slip fit plug that has a point to engage the center punch mark. If true holes are required holes are spot drilled with a drill of required size, then drilled a little under size and reamed with a rose reamer.

Parts to be laid out should be whitewashed or otherwise coated so scribed lines will show up. A locomotive back cylinder head is a typical example of hole spacing on a circle and will be considered in detail. Upon examining the drawing, Figure 1, it

STARRETT TOOLS



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will be noted that the holes straddle the center line at the bottom, and that there are 31 holes. A concave recess on the bottom of some of the heads lines up with the cylinder cock hole in the cylinder. Some cylinder heads have a clearance space extending part way around the bottom on the periphery of the part of the head fitting in the bore, to clear a wide bearing on the bottom of the piston. These recesses (not on the head illustrated) are cast in the head and require no machining. The lug for supporting the guides is planed before the holes are laid out and the vertical center line of the head should be square with this surface.

HOW TO BEGIN

The first operation in laying out is to scribe the stud circle. The center from which the scribing is done and the flange of the head are not in the same plane so it is necessary to measure the drop from the center of the head to the flange. The actual radius to which the trammel points are set is then equal to the hypotenuse of a triangle having a base equal to the radius of the stud circle and an altitude equal to the drop of the head. This may be calculated or laid out on the face plate and trams set to this dimension. The stud circle is then scribed on the head and as a check its diameter is measured with ordinary calipers and re-drawn if necessary.

The vertical center line is established by projecting (with a straight edge) the plane surface where the guides will rest till it cuts the stud circle. This locates two points on the circle equidistant from the vertical center line. A point is located on the circle by scribing from these two

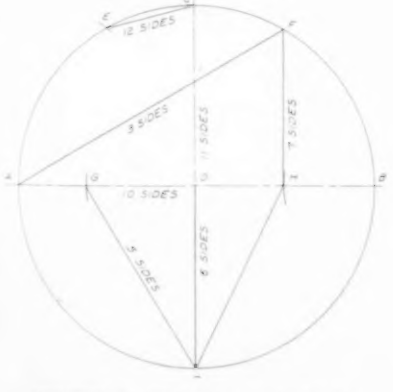


FIGURE 2. Dividing a circle by geometrical methods.

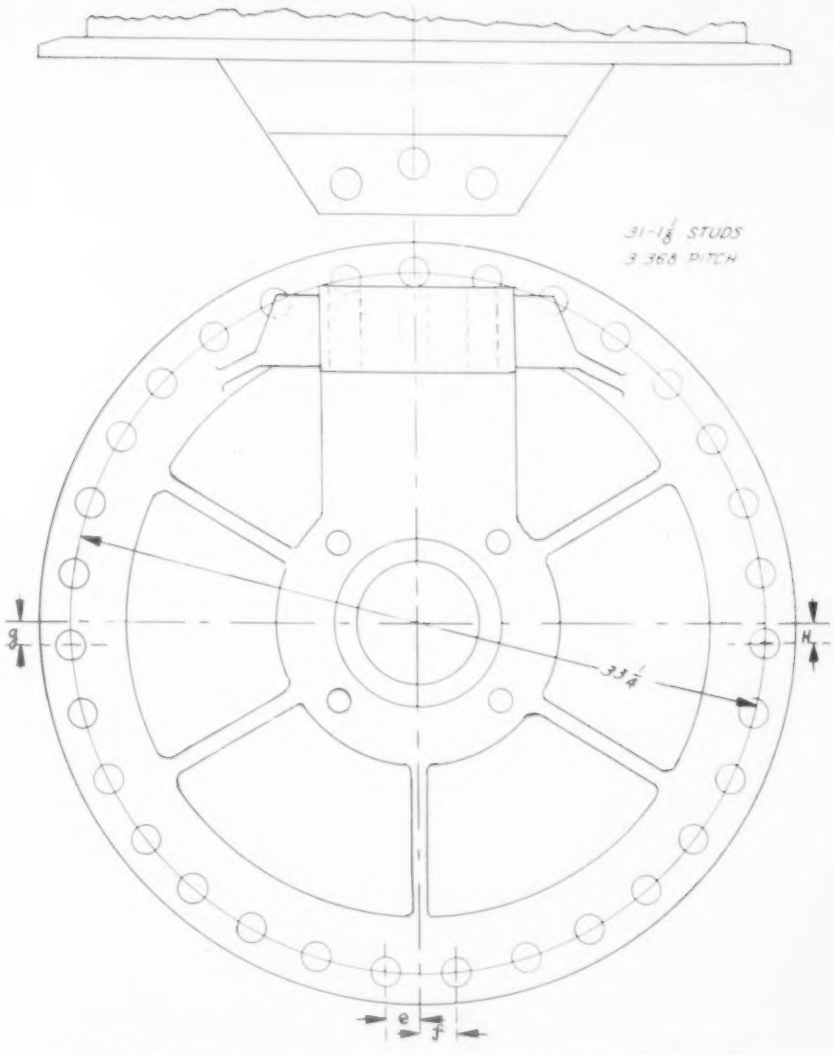


FIGURE 1. Laying out 31 holes on a locomotive back cylinder head.

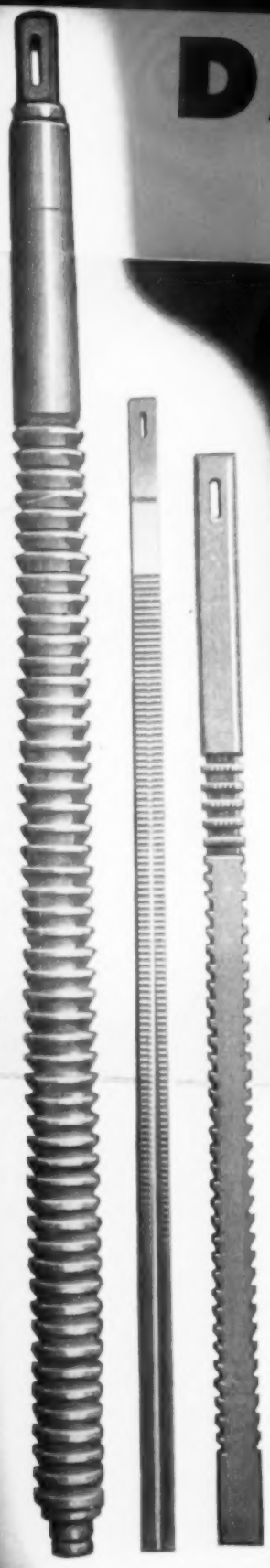
points, that is, on the center line. This is used as a starting point in quartering the head. This may be done by trial and error, adjusting the trams till they will step around the circle exactly four times. A better way is to calculate the side of an inscribed square, that, by the methods of trigonometry is .70711 times the diameter. If the trams are set to the length of the side of a square inscribed in the stud circle, this length may be stepped twice, both ways from the starting point thus quartering the circle.

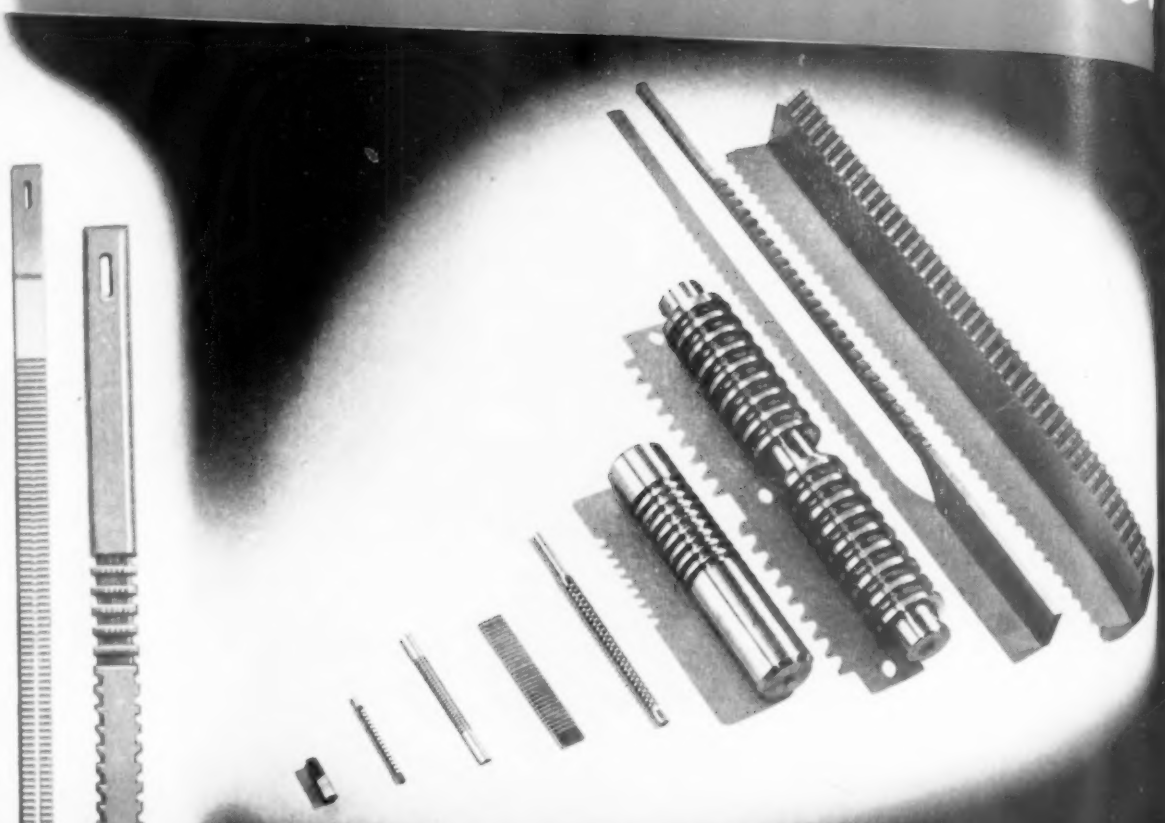
The next step is to calculate the pitch or distance between adjacent holes. This distance is often given on the drawings. It may be calculated by the methods of trigonometry, by the following formula:

Sine ½ the angle between two adjacent holes multiplied by the diameter of circle. The angle referred to is the angle at the center of the stud circle between two radii passing through the center of holes. It may be found by dividing 360 by the number of holes. In this case 360 divided by 31 equals 11.613 degrees, and the sine of ½ of this angle equals .10117. This is multiplied by the diameter 33.25 to give the pitch, 3.368. The method above requires the use of a table of sines such as is given in handbooks, and is a bit cumbersome because trigonometric tables are given in degrees, minutes and seconds. There are tables available that give the functions in decimal parts of a degree, or by an arithmetical operation the decimal may be converted to the sexagesimal system. Some handbooks give tables especially prepared for setting dividers in dividing circles giving the number of divisions and the sine of ½ the angle, covering all cases likely to be met with in practice.

The dividers are set to the pitch

DALZEN *Broache*





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figured and used to step around the circle both ways from the starting point. If dividers are sharp and the stud circle well scratched on the metal, it will be possible to step off the divisions for trial without making any prick punch marks. It is usually necessary to make slight adjustments in the dividers to make spacing come out right as any error is multiplied by the number of steps, and dividers spring slightly. The center lines furnish a means of checking the accuracy of the work as dimensions "e" and "f" should be equal, also "g" and "h". ("h" is not shown) In dividing a circle or any mensuration operation every effort should be made to eliminate cumulative errors. Thus in laying out a number of holes on a straight line all measurements should be made from a fixed starting point, (usually the first hole) rather than measuring from one hole to the next. The number of holes should always be counted as cases have occurred where one hole was added or left out entirely, and not noticed because the head was not quartered or holes not counted.

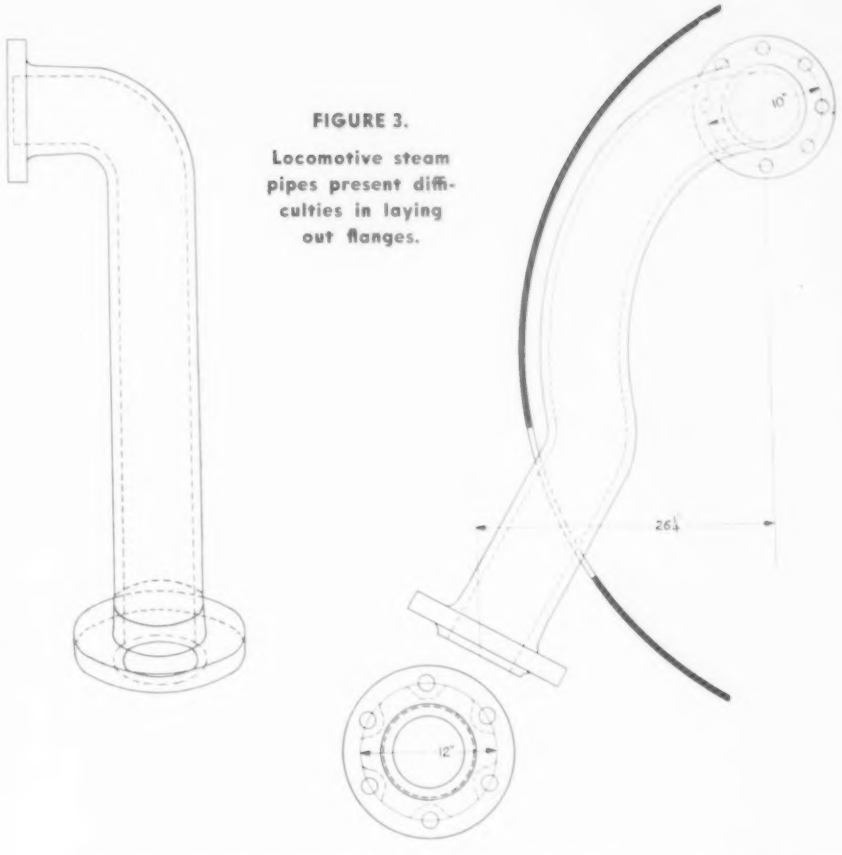

FIGURE 3.

Locomotive steam pipes present difficulties in laying out flanges.

DIVIDING A CIRCLE

Geometrical methods are often useful in dividing a circle. Most mechanics and draftsmen know that the radius of a circle equals the length of one side of an inscribed hexagon. Few, however, know that a line (apothem) connecting the mid point of one side of an inscribed hexagon with the center, will step around the circumference seven times. Figure 2 shows a simple construction that will give dimension to set dividers to step off a circle of the various divisions indicated. A circle of the required diameter is drawn and center lines AB and CD drawn at right angles. Chord AE is layed off on the circumference equal to the radius of the circle and chord EF also equal to the radius. AF is the side of an inscribed equilateral triangle. From F a perpendicular is dropped to AB intersecting AB at H. It will be found that FH is the length of one side of an inscribed polygon having seven sides and this length may be used to space seven equally spaced holes on a circle. HD is drawn and the length HD is layed off H to G. Gd is the length of the side of an inscribed pentagon. OG is one side of a decagon, and OI minus about two per cent of its length will go around eleven times. This geometrical method is often a time saver and the length for various other subdivisions of a circle, if multiples of those indicated, may be easily laid out.

HOW TO LAY OUT FLANGED PIPES

Laying out flanged pipes often presents different problems. Figures 3 and 4 show a locomotive steam pipe, sometimes called "bow-legged pipe," that is located in the smoke box or front end to supply the cylinder with steam. These pipes are right and left, one for each cylinder, and extend from the header to the cylinder one on each side of the interior of the smoke box. At first glance it appears difficult to lay out the holes in the two pipe flanges that are in planes 90 degrees from each other so that the holes will line up when the pipe is in place. These pipes are cast approximately the correct length and a study of the drawing shows that the location of the holes in the top flange is governed by the offset or dimension shown in the drawing. (Figure 3).

To lay out such a flanged pipe, place

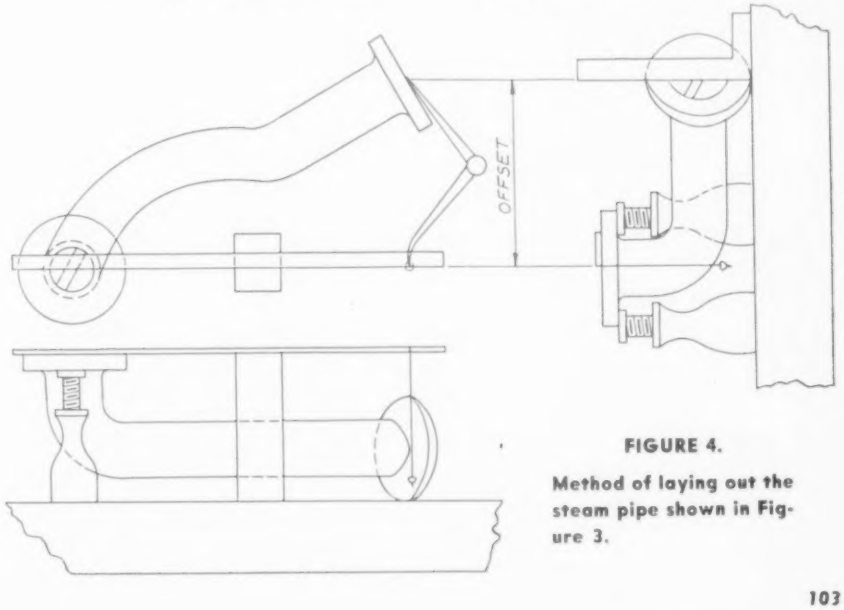

FIGURE 4.

Method of laying out the steam pipe shown in Figure 3.

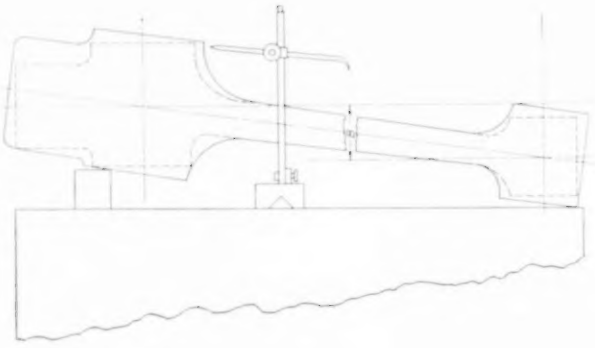

FIGURE 5. Laying out to obtain specified offsets on heavy pieces, where insufficient stock has been left on forging to lay off to specification and to keep center line of part parallel with layout table.

it on a large face plate or other true surface and level the header end or top in both planes. Jacks and blocks may be used to advantage and if desired pipe may be clamped down in the level position. Centers are located on lead or wooden strips central with the rough internal diameter of the pipe. The center line of the cylinder end is then drawn (after leveling other end) perpendicular to the face plate by the use of a square. A long straight edge is then applied to the upper or header end and adjusted till the required offset inches in the drawing is obtained. This is obtained by calipering with a large pair of inside calipers from the center in the cylinder end of the pipe to the edge of a square placed against the straight edge. See Figures 3 and 4.

In adjusting the straight edge it is clamped so that it intersects the center of the header end of the pipe while the required offset is obtained by the use of large square and inside calipers or plumb line and calipers. Having adjusted the straight edge to the proper offset, the center line is drawn across the header end of the pipe along the straight edge. The stud circles are now drawn on each end of the pipe to specified diameter and the holes stepped off in the usual manner noting whether they are "two up" or "one up", that is whether they coincide with the center lines or straddle them. Six or eight holes, frequently used, offer little difficulty.

Flanged pipes may be laid out by trial in the following manner: The pipe is put in place before drilling it and the mating surfaces brought into the position they will occupy. A plain mark, such as a chisel mark, is placed across the adjacent sides of the flanges. The pipe is then removed and a template taken of the holes and marked as above. This is used to lay off the holes in the pipe, aligning the mark mentioned.

TO OBTAIN SPECIFIED OFFSETS

To make parts of valve motion rods and levers fit properly, offsets are often specified in the drawings. In forging these parts, unless the offset is large, it is ignored and must be taken care of in laying out and machining. This would offer no special difficulty if there were enough stock allowed on the forging to lay off the specified offsets and keep the center line of the rod parallel to the lay out table. Often, however, there is little stock on the fits and it is necessary to obtain the required offset by inclining the center line of the long portion of the rod so it forms an angle with center line of the other parts.

The result is somewhat the same as if the required offsets were obtained by bending and lining up the part. Parts may be layed out on the face plate in this manner by the use of blocks to give the required offset. A surface gage is used to scribe the "square" portions of the rod. See Figure 5.

OBSCURITIES IN BLUE PRINTS

As an example of some of the difficulties apt to occur in reading blue prints, Figure 6 is presented showing a locomotive reverse shaft of the built up type. The ends of the shaft portion are turned in the lathe and the arms shown are pressed or shrunk in place. Locating the holes offers no difficulties, but the keyways look puzzling. These keyways might be located by showing the angle they form with the vertical center line of the assembly with the reach rod pin plumb, but the draftsman has chosen another way to locate them.

It is necessary to lay out the keyways in the shaft and mill them before the arms are mounted. Although somewhat obscurely shown, it is known that the two 25 inch lever arms are level with respect to each other, and that the angle of the center line of the keyways with reference to the center lines is the same on the opposite ends of the shaft. The keyways may be located by laying out the parts full size on a flat surface and actually measuring from the quarter line. This distance is then transferred to the shaft (previously quartered). Sufficient dimensions are also given to calculate the angle of the keyways by the methods of trigonometry and then lay them out with a bevel protractor. Referring to the view showing the right hand arm (the double arm) it will be found that the center line of the keyway is 1-13/32 inches from the vertical center line of the shaft measured around on the circumference of the 4-3/8 inch shaft.

THE END

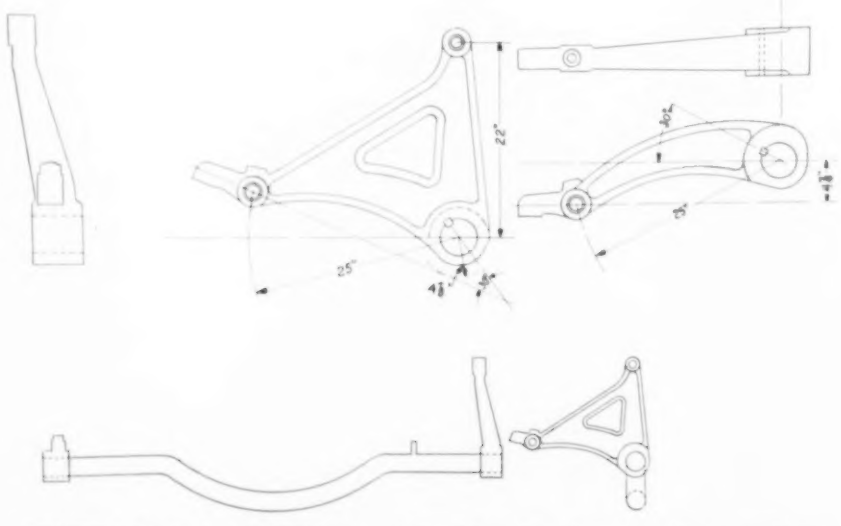

FIGURE 6. Typical of difficulties in reading blueprints, keyways offer a problem.

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5. Apply accurately variable pressure either static or in motion?
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8. Obtain continuous automatic reversing drives at constant R P M or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

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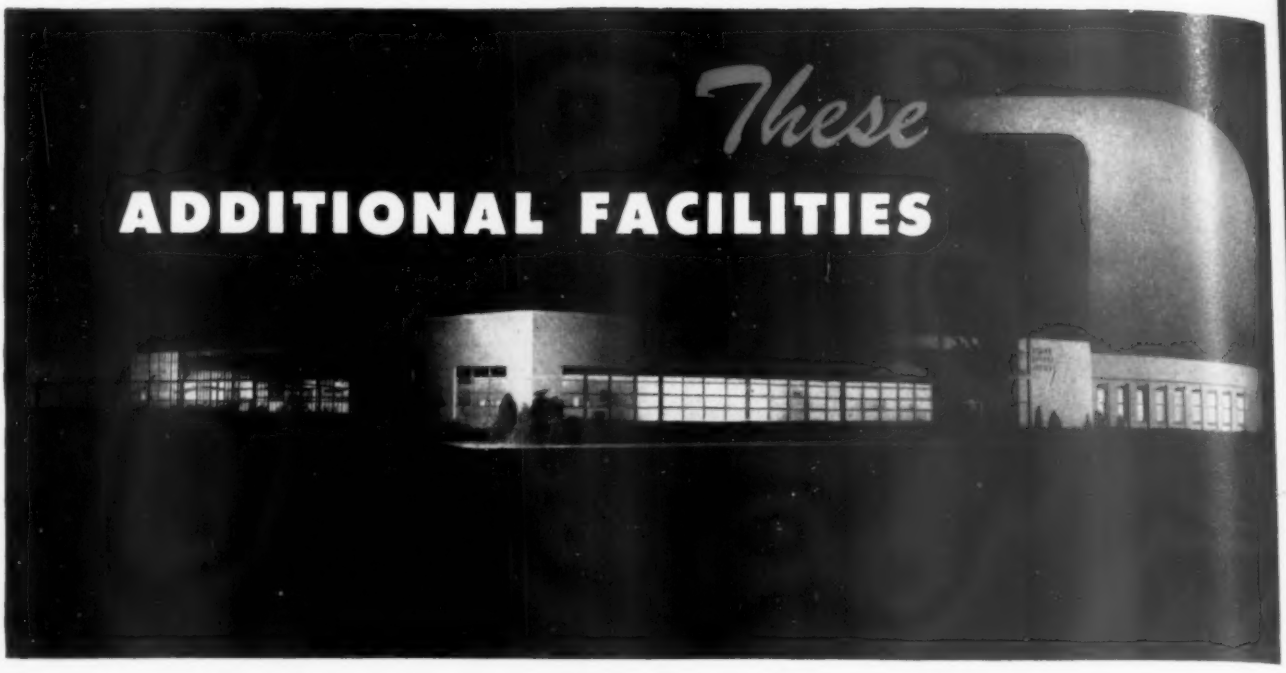

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Since the Detroit Broach Company was organized, the history of this company has been one of steady progress. With these additional facilities, Detroit Broach continues to be in a position to meet *your* broaching needs.

Shown above is a night photograph of the Detroit Broach Company plant in Detroit.

COMPLETE BROACH SERVICE

DETROIT BROACH COMPANY

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Production Control

GEORGE T. TRUNDLE, JR.
PRESIDENT
THE TRUNDLE ENGINEERING COMPANY

Production control is a tool of management according to this well-known industrial engineer. The difference between post-war failure and survival in many plants may be improved manufacturing sequence, he says.

IT IS ESSENTIAL, in producing for victory, that plant equipment be utilized to its most effective capacity upon work which it is best fitted to do.

Plant space must be used to the best possible advantage.

Labor must be used where its training and experience can serve best.

These objectives can best be obtained through setting up a system of production control.

In these days of war production the sales and financial aspects having to do with production control have been subordinated to the major consideration of maximum output. So I shall not go into such subjects as markets, pricing, costs and design, but will confine my discussion to the production side of "production control."

There are four major factors upon which a company's production efficiency largely depends. They are: 1. *Planning*. 2. *Routing*. 3. *Scheduling*. 4. *Dispatching*.

I could, of course, give you examples about how each one of these things is handled in various plants with whose operations I am familiar. But I don't think that is the best way to approach the subject. For just how each one of these problems is to be handled depends upon the situation within any given plant—its products, its equipment, its layout, its personnel, and so forth.

I think it would be more practicable to give you some kindergarten definitions of what we mean by planning, routing, scheduling and dispatching.

PLANNING:

Planning of exactly the sort I am writing about started long before the days of factories. It started on the farm.

Take an ordinary general purpose farm of the type so common in states like Ohio and Pennsylvania.

A farmer has, let us say, one hired man, and he has 120 acres that he can put into hay, wheat or oats. Which does he choose?

You know the answer. He splits the land up three ways and raises about 40 acres of each. But do you realize why? If the price of hay was high and wheat and oats were low, why wouldn't he raise all hay?

Here's the answer: Hay ripens in June. Wheat ripens in July. Oats ripen in August.

That farmer with one hired man can handle a 40 acre crop of hay in June, and still take care of the rest of his farm work. He can handle 40 acres of wheat in July, and 40 acres of oats in August.

But he and one hired man couldn't handle 120 acres of hay in June. They couldn't handle 120 acres of wheat in July or 120 acres of oats in August. There would be too much work for two people in too short a time.

That farm example illustrates the principle behind industrial planning.

Planning determines all the factors to be controlled and projects the production operation through all its stages from the receiving platform to the shipping floor. If properly done, it will mean that, barring unforeseen factors, facilities and men will operate at a steady pace and with proper relation to each other with maximum output as the result.

Euclid, the Greek philosopher who was the father of geometry, started modern industrial routing when he laid down the axiom, "A straight line is the shortest distance between two points."

The most practical routing engineers are small boys. Did you ever see a corner vacant lot that didn't have a diagonal path across it? Did you ever see a small boy who didn't have a hole in the back fence? And yet, for some reason, only too often when these boys grow up and get into factories they stick to the sidewalks of tradition and forget all about the childhood game of finding shortcuts.

In a factory I would say that routing is the job of establishing the operations to be performed and of prescribing the shortest operational path of travel that will carry the work to the equipment where it can be performed most economically.

Now, naturally, routing is closely related to plant layout. In designing a new plant, it is laid out with an eye toward the routing of the work.

But that doesn't mean that an old plant has to be torn down and rebuilt in order to get proper routing. Imagination and ingenuity will do wonders.

Scheduling, in the sense in which I am using the word, has to do with the timing of operations to a far closer degree than you might expect.

A football team has a schedule—but not the kind of schedule I am talking about. Consider, by contrast, the kind of timing it takes to put on a play.

A play has to start at a predetermined minute. All the scenery has to

be in place before action can start.

Each actor has to come in exactly on his cue. Between the acts, the scenery must be changed in a certain number of minutes—no more. If anything in that show is off by as much as a minute, trouble follows. And in the theater, this sort of timing, this marvelous example of complete coordination, is carried through successfully night after night.

Can't we try to run a factory as efficiently as actors run a theater?

Plant scheduling consists, I would say, of listing all the parts to be made and telling when each component part of any unit to be produced must start at the point specified by routing so that the complete unit will be done at the time specified by planning.

The work must flow through the plant in such a way that whenever it is time for one part to enter the assembling picture, that part is there on time and in the right quantity. That part should come in on its cue just as an actor in a play comes in on the cue. If the actor doesn't come in, the show stops. That's exactly what happens in a plant.

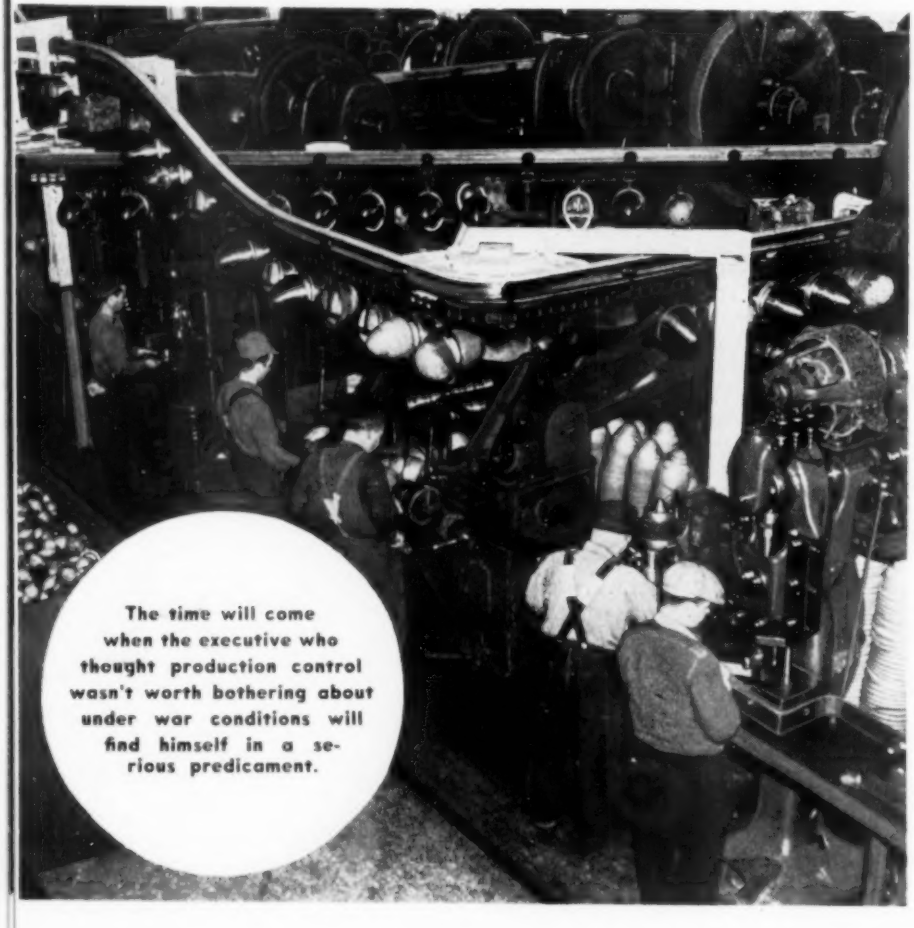
Let's say that a battle is about to start. The attacking army is ready. Its planning, routing and scheduling have been done. Now—what actually starts the battle?

It is started by dispatches ordering the various units to proceed. Company K may know that the plan is for it to go into action at eight o'clock, but it won't go into action until it gets the word.

Furthermore, headquarters may shift somewhat from the original schedule depending upon the course of the battle. There may be changes in timing or in emphasis. Somebody may need reinforcements. Headquarters, with its corps of observers, knows the overall picture and can make minute-to-minute changes.

That is exactly the job of dispatching in the plant. It is the job of actually assigning work to definite work places, and, when necessary, accelerating or retarding its progress in the light of the general plant situation. It is the final step in the actual application of the planning, routing and scheduling previously done.

Now, with this four point program inaugurated and carried through, a plant is operating in balance. No department is ahead or behind. No department is making too much or too little. Every machine in every plant is being utilized. Of course, no one could ever quite reach this theoretical ideal, but you would be surprised to find how close to it you can come.



The time will come when the executive who thought production control wasn't worth bothering about under war conditions will find himself in a serious predicament.

MATERIALS DIFFICULTIES:

However, this whole method of operation presupposes that it is possible for a plant to obtain the necessary materials in the right quantity, when and as needed. And, under wartime conditions, this has in many cases been difficult indeed.

The result, only too often, has been a feeling on the part of management that there was no use trying to aim at the high objective of production which I have outlined, because, with material supplies uncertain, planning, scheduling and dispatching on any practicable basis were impossible.

However, I think there is just as much to be said on the other side of the case. I think many executives are altogether too much inclined not to bother with the hard work and application it takes to set up planning, routing, scheduling and dispatching, on the ground that material difficulties and other war contingencies will interfere. "What's the use," they say. "If we did get our set-up all worked out, something would happen so we couldn't use it."

This isn't an answer. It is simply an alibi. And executives who are using this alibi are not exactly in a position to complain when some of their men stay away from the shop upon similar grounds.

When a shop is out of balance, when one department is ahead and another behind, and when management doesn't seem inclined to do anything about it, how can you blame a man at a machine for going fishing; especially if two days out of the week, when he comes to work, he finds there isn't any work for him to do because the department ahead of his has fallen behind? If the boss doesn't care, why should he?

It seems to me that regardless of materials difficulties — and I grant they are real difficulties—every plant should endeavor to go just as far as it possibly can along the lines which

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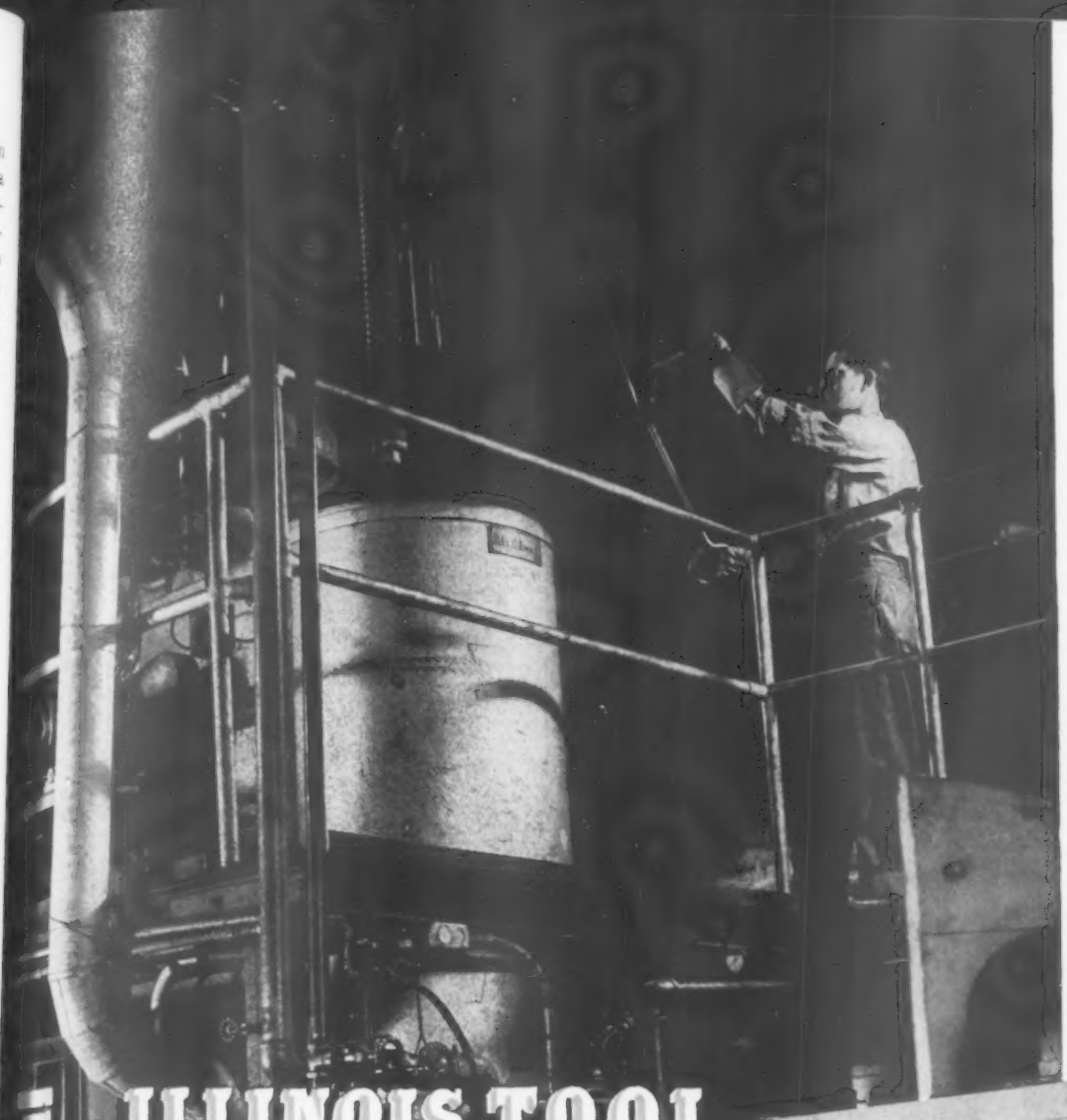

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Broaches being lowered into the furnace for tempering.

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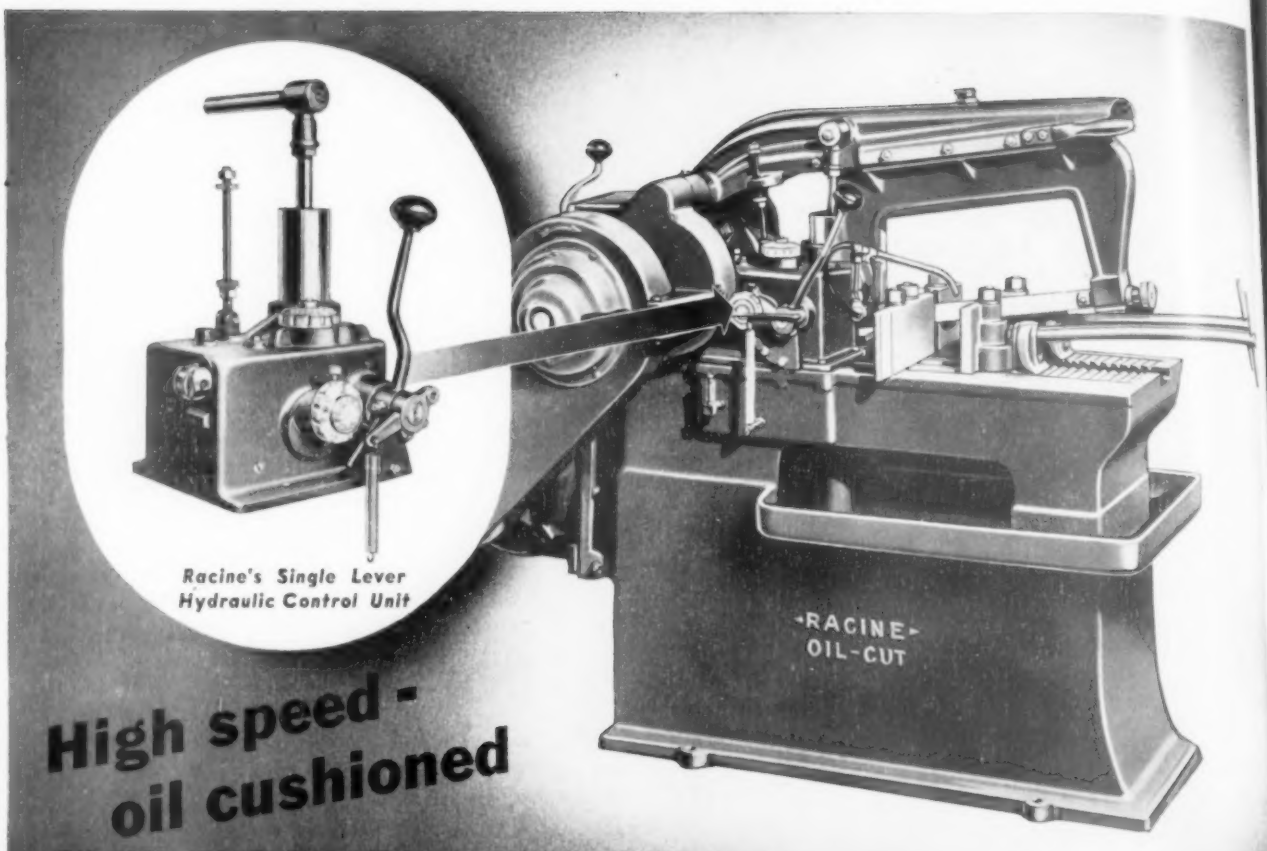

High speed - oil cushioned RACINE metal cutting saws

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Efficient, accurate control is essential in War Production today. Racine provides this precision with the above compact, control unit. Two dials sensitively control pressure and feed —a flexible feeding action that automatically regulates itself to the kind, size and shape of work, speeds production and saves blades. Capacity 6" x 6"

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Three-speed transmission for high speed production — Double Vise Jaws — Saw frame eliminates blade distortion — Adjustable Saw Guide. Other model capacities 6" x 6" to 20" x 20". There is a Racine Saw that will do your job. Complete information and prices on request. Address Dept. TE-S.

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RACINE

RACINE TOOL and MACHINE COMPANY

Standard for Quality and Precision

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(Concluded from page 108)

I have here described.

And this is not just a matter of production for war. It is by way of preparation for peace.

Today too little attention is being paid to costs. Of course, in the war emergency, money is not as important as time. But one of these days this war is going to be over; and when that happens we will all be right back again in a wide-open competitive picture, where costs will be the measure of survival.

When that time comes the executive who thought it wasn't worthwhile bothering with production control under war conditions will find himself in a serious predicament. For he can't complete planning, routing, scheduling and dispatching overnight. Not only his working force, but his supervisory force will have become accustomed to the philosophy that unbalanced production is the normal situation and that you can't do much about it.

Is that any position to be in as a start toward capturing post-war markets? THE END.

POST-WAR VIEWS: AIRCRAFT MANUFACTURE

•

Consolidated Vultee Chief Discusses Markets, Methods

W. A. SCOTTEN
ASSOCIATE EDITOR

SCOFFING at the current prediction of American skies blackened by the wings of small private airplanes soon after the war, Harry Woodhead, president of Consolidated Vultee Aircraft Corporation, says he is unable to visualize the continued operation of the nation's warbuilt aircraft plants on today's mass production schedules when hostilities end.

Woodhead's remarks, in an interview with The Tool Engineer, are particularly significant to production engineers confused by the welter of predictions on post-war manufacturing in aircraft. He made it clear that he was discussing the post-war problems of his industry from the viewpoint of a production man.

Though Woodhead's company currently is mass-producing one of the outstanding light planes from the post-war market viewpoint, he does not foresee young men returning from war to flood the aircraft builders with orders for so many small ships that small ship assembly lines will be humming.

"There are three things these young men will do," he said. "First, they will get a job. Second, they will buy an automobile. And they will look for a light plane to use on week-ends."

Asked for his opinion of post-war aircraft design, developments and methods from a manufacturing standpoint, the production-minded Consolidated chief predicted a feeling out period before the scope of civilian aviation becomes known.

The future use of the designs and production facilities for the big four-engine bombers such as Consolidated

(Concluded on page 214)

LARGE or SMALL PUTNAM END MILLS

Whether of 1/16" diameter or sizes up to the largest end mills made, all Putnam Hi-Speed End Mills permit maximum speed and feed. In addition, manufacturing and heat treating methods assure unusually long, trouble-free service. It is by actual use on your toughest milling jobs that you can prove to your own satisfaction that the end mills which do "cut faster and last longer" are produced by Putnam.

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ARMY E NAVY AWARDED AUG. 15, 1942

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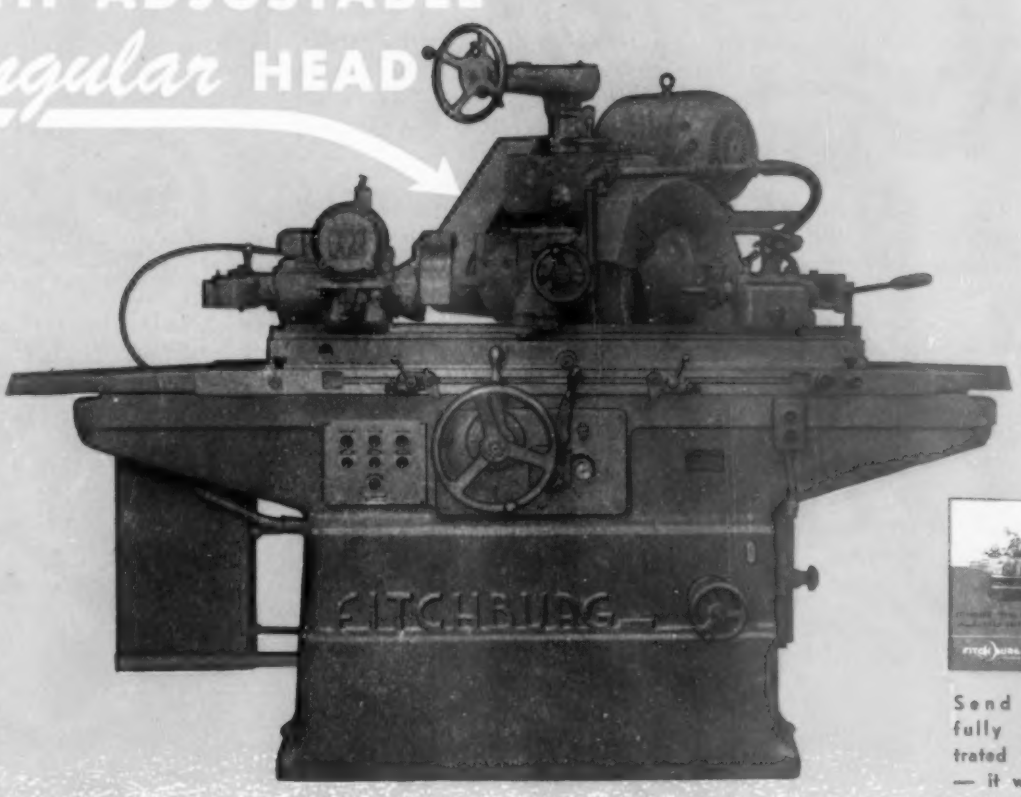

Send for fully illustrated folder — it will be mailed free.

This latest of Fitchburg plain cylindrical grinders, the Type "C" Angular Head Grinder, is designed to handle a wide range, and a number of types of jobs. It will cut grinding time and grinding costs.

The Fitchburg Type "C" Angular Head Grinder is adjustable. It has a standard Wheelhead Unit mounted so that it may be located to grind from 0 degrees to a 45-degree angle. The Bowgage head can be swivelled to various positions for standard plain cylindrical grinding, providing a wider range of grinding.

The Fitchburg Type "C" is completely automatic, the workhead is adjustable for various lengths of work and the work spindle can be equipped for single or variable work speeds.

The Fitchburg Type "C" Grinder is designed to meet wartime production speed and maintain highest efficiency. In every detail it meets all the requirements of plain cylindrical and taper grinding — in large or small lots of work, with assured accuracy and fine finish, at low cost. Write for complete information today.

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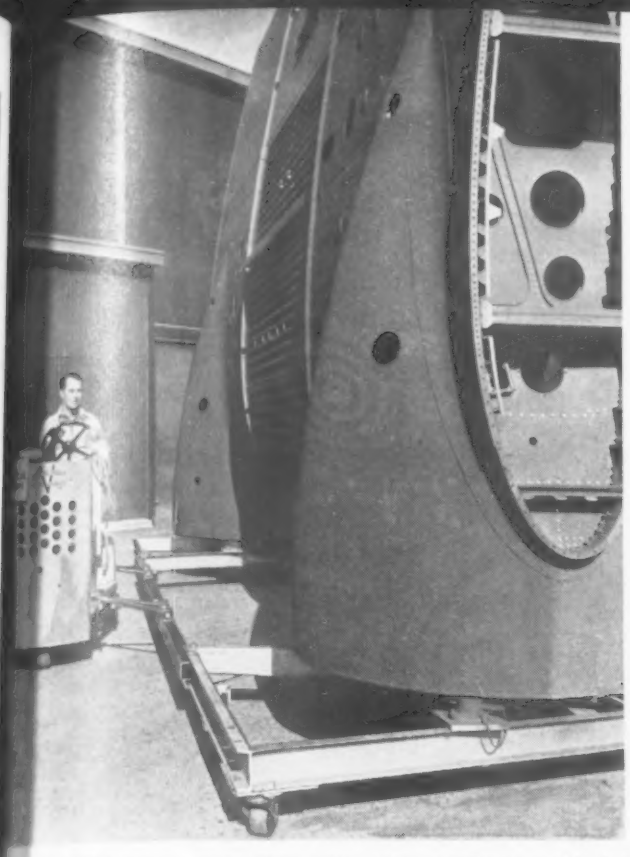
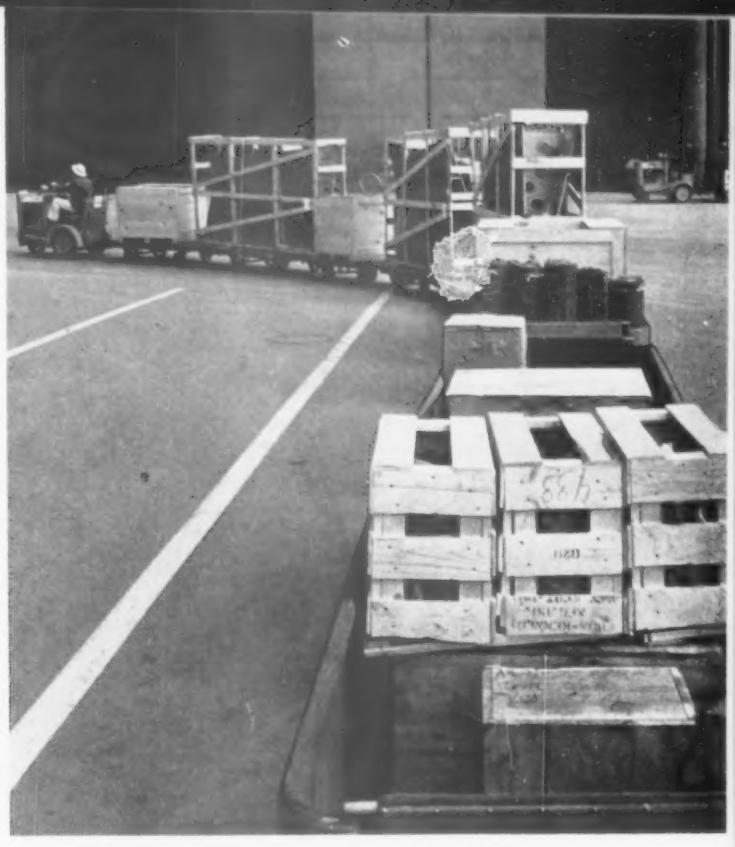
Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.



A half-dozen or more men were once required on this job

A simple attachment was welded to a tug, and now a single worker moves the huge center-wing section of a "Skytrain."



Production train nears a Douglas final assembly building

Loaded with parts needed in modern warplanes, this train is one of several which Douglas operates on 24-hour schedule.

Materials Handling at Douglas

IN the transportation office at the Long Beach plant of Douglas Aircraft are two large boards covered with a variety of colored strings which show the routes of the Internal Transportation system. Beside these boards are arranged complete schedules for the route on a twenty-four hour basis.

This is the nerve center of a trackless train network serving a complete "City" of thousands of workers producing bombers and cargo transports. It is the backbone of Douglas Aircraft materials handling system.

Involved in this organization are 24 gasoline tugs which handle 1,300 flats or freight cars; electric tugs, which supplement the gasoline power; pickup trucks for special assignments; and fork trucks which do the necessary heavy loading or unloading of the trains, plus additional heavy lifting throughout the plant.

The majority of these trains work full time in transporting raw stock to fabricating departments, picking up completed and inspected parts to be carried to sub-assembly sections and hauled to final assembly lines.

At sub-assembly buildings the tugs drop off the proper flats at central receiving and dispatch depots, and pick up the loaded cars routed to depots in the final assembly buildings.

These two groups of buildings have feeder systems operating to and from the central depots. In this way the "through" trains are not delayed by delivering their loads to each department within the buildings.

As the whole purpose of any Internal Transportation system is to facilitate flow of materials through a plant, such timesaving devices as feeder systems aid tremendously.

TRAINS SERVE MANY PURPOSES

Special tooling trains make scheduled runs on separate routes, picking up needed templates and jigs at Tooling headquarters to be delivered to proper fabricating or sub-assembly departments. Used tooling is also returned to the same headquarters.

The Internal Transportation system plays an important part in scrap control in Douglas plants. All scrap metal trimmings or shavings are placed in boxes marked for the various types of salvage material. These boxes are gathered by fork trucks and taken to the salvage department. These forks do their handling of the salvage boxes plus furnishing motive power for the salvage trains.

Due to the extreme size of the plant, in both area and personnel, it has been found necessary to establish outlying cafeterias which are supplied with food, utensils, plates, cups and glasses from a centralized main kitchen. To expedite food delivery, cafeteria trains carry the hot food in specially designed trucks to various outlying units, later picking up dirty utensils for return to the main kitchen.

From far out on the edge of the 240 acre plant, a Paint Train makes a regularly scheduled run to paint booths located strategically through the plant. Like other special trains in The Douglas system, the Paint Train is operated on schedule that is synchronized with requirements in the factory.

Tugs equipped with special welded handling fixtures move the huge center wing sections and fuselages of the Douglas C-47 "Skytrain" from sub-assembly buildings to the final assembly line.

Outer wings for transport planes are moved by tugs into the position where they are readily available for attachment to the balance of the airplane.

Engines and propellers are uncrated and cleaned in a receiving building, and then placed on fixture-equipped flats. So well planned is the Douglas plant transportation system that tugs arrive on schedule, and the train rolls off to power plant sections of the final assem-

(Concluded on following page)

Whether it is a single tool, a sheet of aluminum or a completed wing section, Douglas Aircraft's Internal Transportation system speeds its delivery.

bly lines at a predetermined hour.

The expansive administration and engineering buildings are serviced by a stationery train carrying all office supply equipment.

It's a man sized job supplying production departments, feeding thousands of workers, furthering material conservation, delivering vital tooling, getting the camouflage paint to proper paint booths as the planes roll through, moving whole major assemblies, and rushing a typewriter ribbon to the busy stenographer.

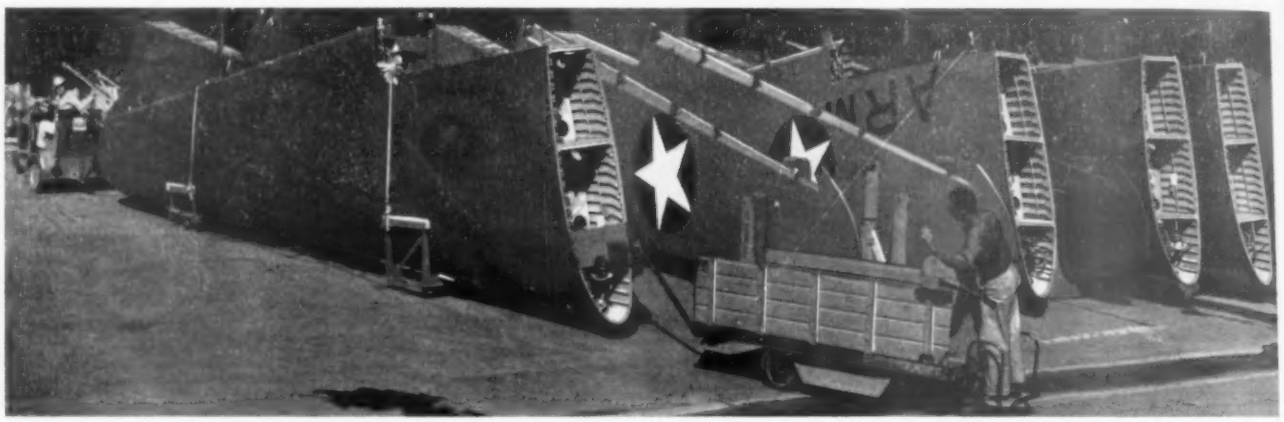
In addition, units for life-saving, fire-fighting and rescue work have been built and equipped. Spotted at strategic points throughout the plant, they are on 24 hour standby in event of an alarm. Should this occur each trainman unhooks his tug, takes it to the nearest emergency unit, to be ready for any emergency. Invaluable auxiliaries to the regular passive defense organization, they supplement air-raid precautionary measures.

Handling 30,000 pounds of material hourly, excluding the special routes, trackless trains at the Douglas Long Beach plant have an exceptional operation record of punctuality. This punctuality, which is the result of careful scheduling and routing of trains, assures uninterrupted production through regular delivery of men, materials and tools.

THE END.

Engines and propellers are protected in transit by specially-built frames

Douglas takes no chances when such valuable property is transported from receiving.



Team work: Electric and gasoline tugs work together in handling Douglas C-47 outer wings

Specially-built dollies facilitate the movement of these husky sub-assemblies.

One of the forks that handle valuable salvaged materials

This machine not only pulls its own train, but releases a crew of men for other tasks.

ADVANCEMENT IN BROACHING

•

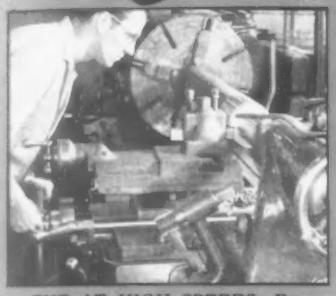
Arsenal Reports Savings

If war production experience has brought any particular machining technique to the forefront, certainly that technique is broaching.

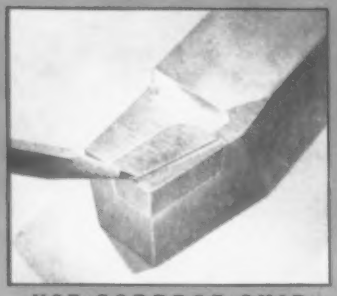
Adopting methods used in automobile plants, broach rifling of machine gun barrels at the Rock Island, Illinois, Arsenal is accomplishing for 10 cents a barrel the job which formerly cost 28 cents a barrel.

"The greatest factor involved in this broach method is that the four machines, which cost $6,000 each, are being used to produce 1,300 barrels per day," says William Baumbeck, the arsenal superintendent. "These machines replace 40 machines which cost $9,000 each and formerly were used to get the same production."

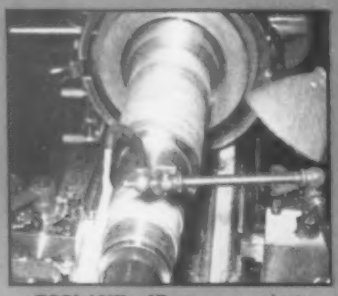
6 STEPS TOWARD TOP PERFORMANCE, WITH CARBIDES, WHEN YOU *CUT STEEL*



CUT AT HIGH SPEEDS—For top performance on the average steel-cutting job, don't cut at speeds less than 200 *feet* per minute. Slow speeds often cause failure.

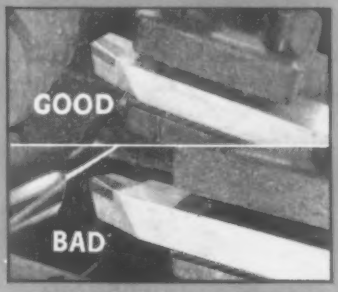


USE CORRECT CHIP BREAKER—When you break chips, break them right. Fit breaker to the job. The ground-in step-type shown is usually best.

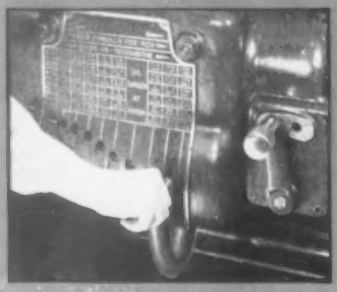


COOLANT—*IF* you use a coolant, provide a heavy, continuous stream, preferably under pressure. If you can't provide ample coolant, it is better to cut dry.

KEEP TOOLS SHARP—Avoid running tools until excessively dull. This causes breakage or drastically shortened tool life. Grind tools at regular intervals for best results.



PROVIDE RIGID SET-UP—Keep tools at absolute minimum overhang necessary to clear work. Chuck part firmly. Rigidity is important with carbides.



FEEDS—For medium and heavy cuts on steel, use feed not less than .010" per revolution, and preferably .015" to .025". Light feeds "rub" tool, causing rapid dulling.

● Important in getting top performance, when cutting steel with carbides, are the six steps shown above. When correctly applied, carbide tools produce results far surpassing the performance of ordinary tools. They operate at machine speeds as high as 4 to 5 times faster than ordinary tools, stay sharp up to 10 times longer, and increase output often as much as 300%.

Important, too, is the carbide you use. When you select from the complete line of carbides produced by Carboloy Company, you get the best type for your particular job—whether it be the popularly designated "titanium carbides", "tantalum carbides", "tungsten carbides"—or "tri-carbide" grades.

Send for catalog GT-142 listing specifications and prices of more than 300 standard Carboloy Cemented Carbide tools and blanks for machining all types of metals and non-metallics.

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FOR HEAVY HOGGING • HIGH SPEED FINISHING • INTERRUPTED CUTTING • ON ALL STEELS

COWL RINGS FASTER for "fighters"

A McKinney built assembling, locating and drilling jig for speeding production of cowl rings for one of the foremost fighting planes.

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McKINNEY precision tooling is stepping up the war tempo — on distant battlefields — in the air — on and under the sea — through outstanding service on the production front.

To the solution of tooling problems, whether conventional, entirely new or uncommonly difficult, McKinney brings decades of experience — a large corps of engineers — hundreds of tool technicians and an extensive plant replete with the finest precision equipment.

McKinney offers — *designing* of tools for production in your own plant — *building* of equipment to your blueprints — or *complete tooling service* from drawing board to finished product.

Send blueprints or ask a McKinney engineer to sit down across the desk to discuss this subject of mutual and timely interest.

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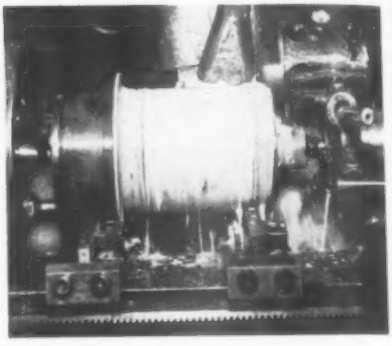
WATER-COOLED ARBOR FOR GRINDING

REDUCTION from 90 to 30 minutes in the grinding time of a thin-walled radial airplane engine cylinder barrel, plus a substantial saving in material, is a typical and noteworthy application of automotive manufacturing technique to the production of these complicated units.

This particular achievement is made possible through the utilization of a water-cooled arbor in Pratt & Whitney engine production by the Ford Motor Company.

Ordinarily, in such grinding, an oil soluble is applied only to the outside of the thin-walled barrels but, because of the extreme thinness of the cylinder barrel, heat from the grinding had a tendency to warp it, resulting in interrupted production, and loss of time and material.

With this new arbor, the barrel is water-cooled both inside and out during the grinding operation, eliminating all warping, and consequently increasing production.



Water-cooled arbor in action in Ford production of aircraft engine cylinder barrels. The coolant is pictured pouring over the outside of the cylinder barrel during grinding. At the right bottom is shown the coolant being discharged after passing through the arbor from left to right.

In addition to other noteworthy features of the Ford patented device, wear on parts is reduced to a minimum. This is natural, as these moving parts so subject to wear are bathed in a constant flow of coolant. This element flows from the end of one center, through the arbor and is discharged from the opposite center through a small orifice. The fluid is kept at a constant pressure of one pound per square foot.

While the invention is speeding war time production of aircraft engines, Ford engineers visualize its wide utilization in peace-time, with results as successful as now being achieved. The auto manufacturer points out that the basic principle involved, that of cooling a piece of metal to be ground by maintaining a constant cool temperature inside and out, is the same whether the operation involves material many times smaller or larger than that of the highly-machined aircraft cylinder barrel. Thus its applications in automobile manufacture become obvious.

THE END

R.S.V.P.

IF YOU HAVE ANY SURFACE GRINDING PROBLEMS— ANSWER THESE QUESTIONS . . . TEAR OUT THIS PAGE AND MAIL IT TO BLANCHARD

THE BLANCHARD MACHINE COMPANY
SURFACE GRINDING MACHINES
64 STATE ST., CAMBRIDGE, MASS., U.S.A.

Are you machining flat surfaces? Yes ☐ No ☐

Is the machining of hard steel a problem? Yes ☐ No ☐

Are you wasting iron on oversize castings so cutting tools can get under the hard skin? Yes ☐ No ☐

Are your labor and machine costs high due to necessity for performing roughing and finishing operations on separate machines? Yes ☐ No ☐

Are you satisfied with your (a) finish? Yes ☐ No ☐ (b) flatness? Yes ☐ No ☐ (c) parallelism? Yes ☐ No ☐ (d) dimension tolerance? Yes ☐ No ☐

Would you like to produce surfaces to a limit of 5 micro inches? Yes ☐ No ☐

Are your lapping operations long and expensive? Yes ☐ No ☐

Is your production rate on flat surfaces equal to the best that can be found elsewhere? Yes ☐ No ☐

Will you allow our representative to call and discuss Blanchardized surfaces and how Blanchard Vertical Grinders can serve you? Yes ☐ No ☐

Our booklet, Work Done on the Blanchard, is free for the asking. It may point the way to economies in your manufacturing department. Would you like a copy? Yes ☐ No ☐

Further comments .....

.....

.....

Name ..... *Position* .....

Company .....

Address .....

BLANCHARD WORK BOOK

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS., U. S. A.

THE SPLIT-SHIFT PLAN

Could you use a few more man-hours of labor? A TOOL ENGINEER Editor reports how white-collar workers are contributing more than 8,600 hours weekly in Warner & Swasey Company shops.

AS much as any industrial center, Cleveland is suffering from the manpower shortage. In most companies this shortage is not a matter of needing 500 or 1,000 men, but of departments in each company which might operate more smoothly if they had four or five additional people. In fact, there are numerous cases where one extra man makes the difference between sufficient manpower and a shortage which overburdens present employment.

Realizing that a tremendous energy and capacity for work must exist in the eight-hour day, white collar group, the owner of a coal yard in Cleveland approached one of the officials of the Warner & Swasey Company with an idea for tapping this source.

This idea consisted of hiring part-time workers in pairs to work four hours each, together filling one job for an eight-hour shift. To start the ball rolling, the coal dealer and a combustion engineer in his company, formed the first split-shift partnership. The one began work at four in the afternoon, and was relieved by the second man on the team at eight in the evening.

OTHER EMPLOYER MUST GIVE O.K.

The plan worked. Today more than 180 pairs of split-shift workers are employed in Warner & Swasey shops. Lawyers and doctors, firemen and policemen, night office workers, early morning milk peddlers, all are eligible. The participants have come from so many walks of life that the hours of their regular full time employment encompass the clock. Conseqently, men and women working on the split-shift plan are employed on all three shifts.

An important consideration in setting up the system was the matter of not draining the energies of workers already engaged in vital war work. To prevent this, the Warner & Swasey employment department asks for a letter from the immediate superior of any candidate, testifying that they have no objection to the man or woman accepting additional employment.

Another factor which had to be figured in the plan was absenteeism. However, the nature of the idea more or less took care of this. Most split-shift workers have asked for employment in order to make what they conceive is a more substantial contribution to the war effort.

NOT CONCERNED WITH DRAFT

With such an incentive, inexcusable absenteeism was not a likely outcome of the plan. Further, these employes generally have found that the extra work, being completely different from that to which they are accustomed, has contributed to better health, and certainly to emotional balance in that they are "doing something."

Adding to income is rarely the reason for seeking employment on this basis. Nor is draft exemption, in that these workers hardly qualify on the "necessary man" ruling. In fact, Warner & Swasey doesn't bother to make a record of their draft status.

As a group, these part-time employes are filling an important need on the production front. They are trained on the job, beginning at regular beginners wages on such tasks as small assembly work. Later, they are upgraded to machine operation. Naturally, time elapsed in training is longer than that required for full-time workers. But again, there is the matter of natural incentive which does not retard these men and women in their endeavor.

MAN-HOUR POTENTIALITY IS GREAT

Today, these workers are of all types and ages. They are found in almost every conceivable shop occupation, bearing in mind the limitations facing any new and relatively unskilled employe. For some, this is the first and will be the last employment in a factory job. There is no doubt that this experience will contribute much to the intelligence with which they decide the issues which face America today and in the post war era.

Some have departed, generally because they discovered that their own business was suffering. But their places have been quickly filled when they have left the shop. Some local publicity, mostly word of mouth, has been responsible for the success of this venture. In no instance has Warner & Swasey advertised to fill these jobs.

A rough estimate of the possibilities for such a plan is to be found in the number of white collar workers, housewives and others who might be available for four hours a day. About 10,000 such available people is the conservative estimate for Cleveland. That means 5,000 units of 48 man-hours per week.

THE END.

Split-shift workers are employed in pairs—it's a unique partnership

When a lawyer completes his four hours at a job, a policeman may take over for the next four hours.

"To err is human" ...and costly!

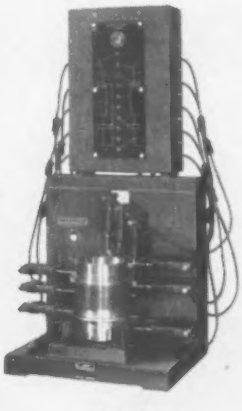
Inexperience, ineptness, fatigue, ill-health, inattention, indifference—all are possible bugaboos when using fixed gages on extremely close tolerance work (i. e., checking to "tenths").

Scrap, wasted time, production slow-downs, faulty products—these are the high costs of rejecting good parts or passing incorrect parts as being good.

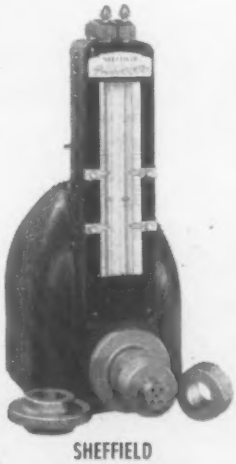
"Hangovers"—physical or mental—make no difference when using a Visual Gage, Multichek, Precisionaire, Electrichek or other Sheffield precision gaging instrument. Mechanical skill built into these gages eliminates the need for "top performance" individual skill to precisely and accurately inspect parts to "tenths".

Sheffield precision gaging equipment eliminates "human" error. Write for new Folder No. 43-1 and name of Sheffield Engineering Representative in your vicinity.

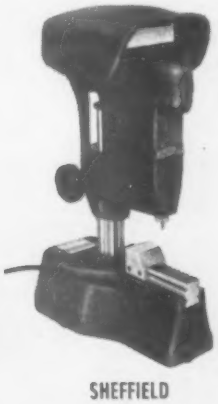
SHEFFIELD ELECTRICHEK



SHEFFIELD MULTICHEK



SHEFFIELD PRECISIONAIRE



SHEFFIELD VISUAL GAGE

THE **SHEFFIELD** CORPORATION

DAYTON, OHIO, U. S. A.

SHEFFIELD MASTER GAGEMAKERS

Movies Demonstrate "Know-How"

ONE of the most potent weapons in the drive for victory on the industrial front in this war has been technical "know-how" and skill in the metal cutting and fabricating trades.

To pass along the fundamentals of this "know-how", whether it be the handling of new materials by old and experienced hands or the operation of standard machines by "green" workers, the motion picture screen is being utilized increasingly by hundreds of industrial organizations. Nonetheless, this production-stimulating tool is yet to be used in hundreds of other shops.

Some of the films available have been prepared for the Government; others by producers of machines and materials. All of those reviewed here, as a service to mass production engineers faced with manpower problems, are technically accurate and were produced under the direction of men actively engaged in metal cutting work.

These films, some in full color and all with sound, can be shown in any semi-darkened room in the factory. Projection equipment can be bought or rented through local photographic supply houses. Other production films were reviewed in the February and April, 1943, issues of **The Tool Engineer.**

HOW TO RUN A LATHE

"THE METAL WORKING LATHE": One of the first two of a series of 16-millimeter sound films based on the book "How to Run a Lathe".

This picture and is companion film has just been released by the South Bend Lathe Works. Filmed in full color at the lathe manufacturer's factory, these pictures represent the most advanced technique for teaching lathe operation to men or women of all ages.

The first film, "The Metal Working Lathe", introduces the standard back-geared screw cutting lathe by familiarizing the student with the names of the various lathe parts, their purposes and operation.

After seeing the film, the student may be allowed to manipulate the various lathe controls, as demonstrated in the picture. The film may then be shown again to answer the many questions that are bound to arise after a first experience with a lathe.

The second picture, "Plain Turning," illustrates all operations in the machining of a shaft held between the lathe centers. It teaches many of the basic procedures encountered in all lathe work. Among these are blueprint reading, measuring with calipers and micrometers, locating and drilling center holes, proper selection of cutting tools, rough turning and finish turning of the workpiece.

These films have been produced specifically to speed up the training of lathe operators. Sound, color and photography have been combined under the direction of expert machinists and experienced educators to provide a most effective instructional medium. These pictures were prepared exclusively for educational purposes by South Bend as a contribution to the war effort.

Both films are 16-millimeter with sound track, and each is approximately 800 feet in length. Showing time of each is about 20 minutes. They are supplied free on a loan basis, with the borrower paying the shipping charges; or they may be bought outright in color or black and white.

Write: South Bend Lathe Works, South Bend, Indiana.

MACHINE TOOL OPERATIONS

"OPERATIONS ON THE SHAPER AND RADIAL DRILL PRESS": This is not one, but a series of eight sound reels on machine shop practice and machine tool operation which are outstanding for their photographic distinctiveness and clarity.

Produced by the Emerson Yorke Studio and photographed in several war plants, these 35-millimeter films are made available by the Government for training machine shop workers. Three reels are devoted to the operation of the shaper: "Cutting a Keyway on the End of a Finished Shaft", "Machining a Cast Iron Rectangular Block", and "Machining a Tool Steel V Block". Two films show operations on the radial drill press: "Drilling and Tapping Cast Steel," and "Drilling to a Layout and Spotfacing Cast Iron".

Stroboscopic action in filming any revolving or reciprocating object, particularly mechanisms operating at high speeds, serves to confuse the actual motion and mislead the viewer by reason of the apparent reversal action of the moving mechanism as depicted on the screen. Stroboscopic action is noticeably absent in both films on the radial drill press.

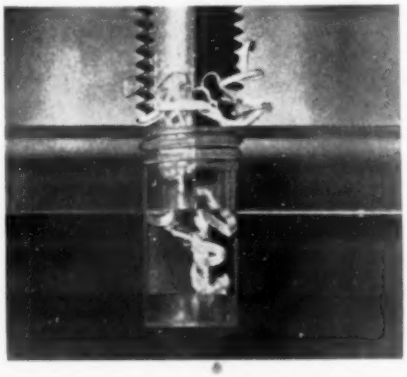
The elimination of stroboscopic action was achieved through planned distribution of light timed to synchronize with the speeds of the revolving drill and the camera. Thus the optical distortion so prevalent in mechanical action films has been successfully overcome in these pictures.

An interesting feature in these films is the utilization of Lucite to demonstrate the action of a tap in steel. Heretofore, line animation has been considered the most practical method of portraying the action of moving parts in opaque bodies and the usual formula consisted of graphing the desired action via a cross-section breakdown.

Now, Lucite, a transparent plastic

(Concluded on page 123)

Camera crew in action during filming of "Plain Turning"
—an educational motion picture, with sound (reviewed in column 1).

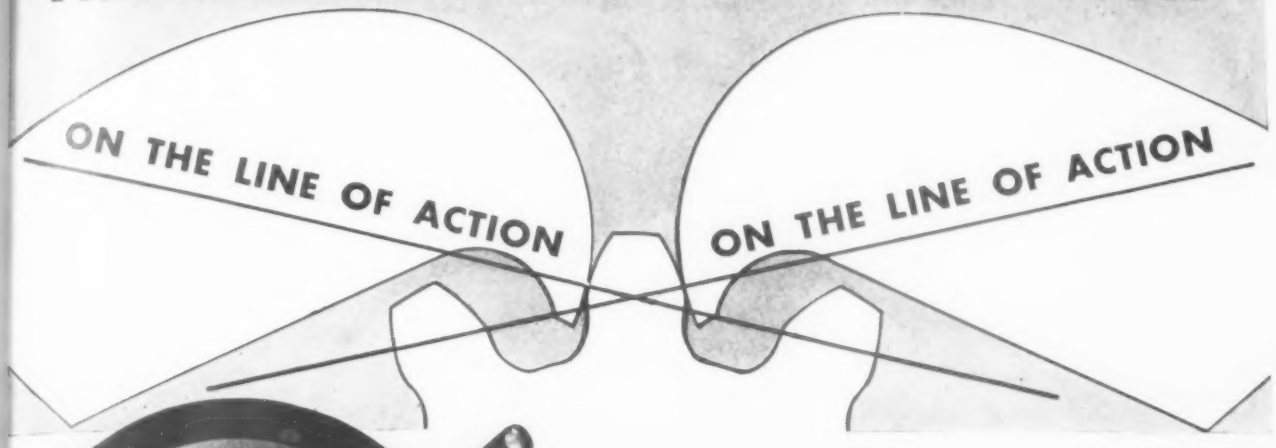


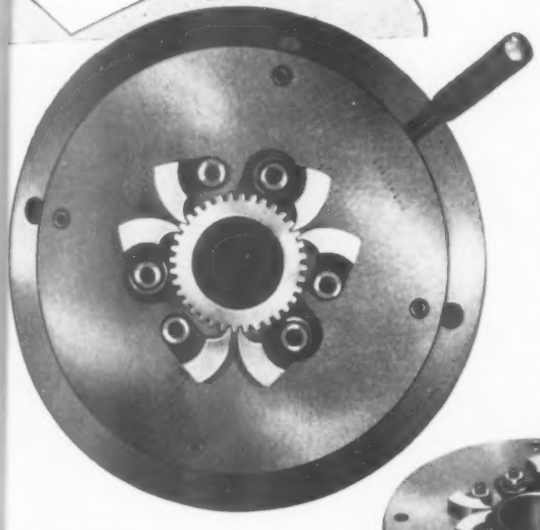
One shot from a series of eight reels
Photographers take advantage of the transparency of lucite to show the action of a tap as it forms threads in a hole.

To Hold Gears *with precision*

FOR BORING OR GRINDING

HAVE TEETH GRIPPED THIS WAY





Method eliminates distortion. Gripping action distributed around circumference rather than through diameter. Principle used only in

MATCH-IT GEAR CHUCKS

For grinding the hole, the hub face, or for boring most delicately constructed gears within your tolerances in relation to pitch diameter. Distance from root diameter to the hole or counterbore of any gear never presents a problem, as pressure is always against the sides of teeth, never toward the center along diameter to cause distortion.

MATCH-IT GEAR CHUCKS are made for internal and external gears, spur and helical gears, and countershaft type gears.

All your gears can have perfect, round holes. If your production gives you too many scrapped gears, perhaps your chucking can be improved. Our engineers can help you deliver a higher percentage of perfect gears.

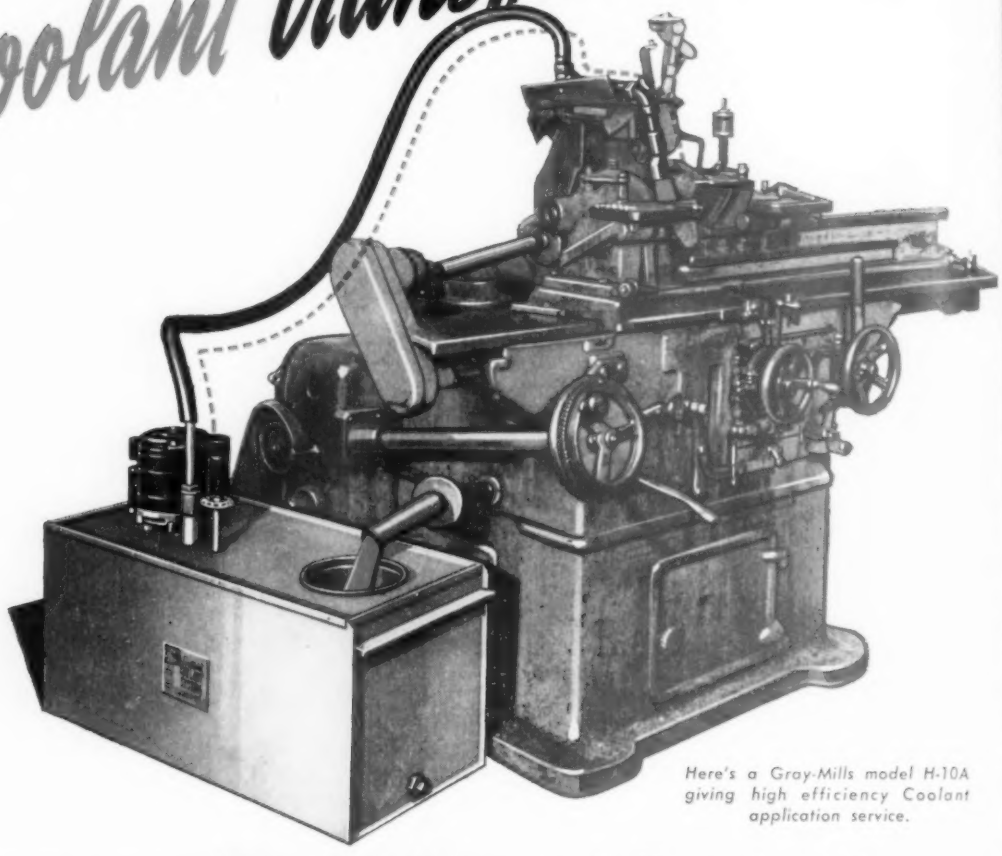
BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2663 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

a coolant transfusion...



Here's a Gray-Mills model H-10A giving high efficiency Coolant application service.

...to increase Tool Life and Production

GOOD machines can be made to do a better job by giving them a Coolant "Transfusion." And the simplest, most efficient way to apply these production-increasing, tool-saving coolants is with Gray-Mills "Controlled Flow" Portable Coolant Systems.

Gray-Mills Systems have increased the efficiency of hundreds of machines on operations like drilling, milling, sawing, grinding, honing, tapping, threading and cutting. They are quickly and easily set up to operate either as a permanent or temporary part of a tool. Sturdily built Gray-Mills Coolant Systems are available in both gear and centrifugal types, with capacities from 50 to 2,000-gal. per hour — controlled flow. Prices range from $39.50 to $189.50.

If you want to modernize your older machines—equip small, large or special tools for greater efficiency—or have a "standby" and "cleanout" system there is a Gray-Mills for the job. Call your distributor or write direct.

GRAY-MILLS CO. • 235 W. Ontario St., Chicago, Ill.

PROMPT DELIVERIES

Send for the new Gray-Mills Catalog— it gives full details.

STANDARD HEAVY DUTY "A" SERIES—with large capacity tanks incorporating baffles and screens. Capacities up to 165 gals. per hour —pressure, 50 lbs. p.s.i.

MODEL "G" SERIES — capacities up to 130 gals. per hour — pressure, 30 lbs. p.s.i.

GRAY-MILLS

...complete portable coolant systems

Use GRAY-MILLS COOLANTS . . . 5 types for most requirements—10 and 55 gal. containers—immediate delivery from your distributor or our plant.

(Concluded from page 120)

possessed unusual light transmission properties has most effectively served the motion picture camera as the medium through which the authentic action of a gap in steel can be illustrated.

Write U. S. Office of Education, Federal Security Agency, Washington, D. C.

MAKING TEACHERS OF EXPERIENCED HANDS

"PASSING THE KNOW-HOW ALONG": Even the skilled mechanic with years of experience is not always a good teacher of what he knows. The technique of teaching is a very definite one, and if properly used not only saves time, and the energy of the instructor, but speeds the learning of the student.

Now, with the demand for trained machinists for war production still growing, the necessity for training machinists right in the shop by already skilled workmen, and in the shortest possible time, is paramount. This picture shows the skilled machinist how to teach.

This new sound motion picture, only recently produced, is approximately one and one-half reels long (15 minutes screen time). It is supplied in 16 millimeter reels.

The basic principles of teaching technique featured in the film stress such operations as bench work, the drill press, welding, the punch press, lathe operation, and sheet metal work.

The picture has been produced on the basis of seven logical steps that help the machinist in passing along what he knows to the learner. Visualized "patterns" made realistic by means of movies and explained by a

Teaching the veteran how to teach

Scene in "Passing the Know-How Along"

voice show the prospective instructor how the average workman learns most rapidly and surely. The picture takes the audience right into the machine shop and shows, in a practical manner, "how to go about it".

Primarily, this film has been designed for showing before these groups: In machine shops, where new workers must be trained; employee classes and foremen's schools; and in classes for instructors, foremen and job setters.

This film provides a pattern of basic teaching in the metal working field which is logical and proved by test and experience to be most efficient.

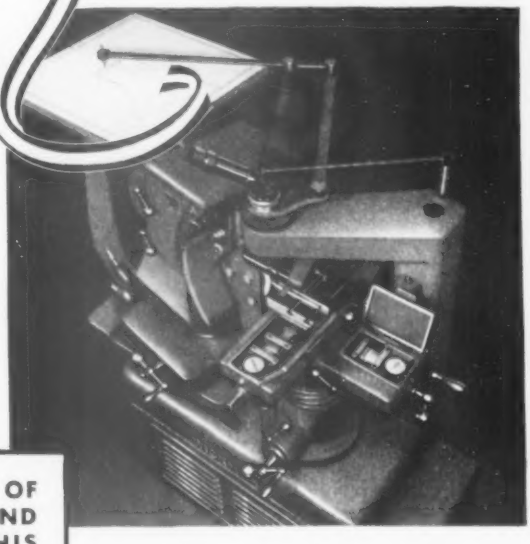
Write: The Jam Handy Organization, 2900 E. Grand Blvd., Detroit, Mich.

THE END

Grinds ANY DESIRED PROFILE

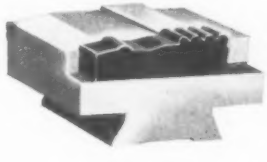
IN TUNGSTEN CARBIDE OR OTHER HARD METALS

DIRECTLY from the drawing



Looking down on the Wickman Profile Grinder showing layout, pantograph, microscope and work table assembly.

TYPICAL EXAMPLES OF WORK GROUND AND INSPECTED ON THIS MACHINE WITHOUT USE OF RADIUS DRESSER OR FORMED WHEEL



Tungsten Carbide Tipped Form Tool
Width of Carbide tip . . . . 1¾"
Depth of Cut . . . . . .150"
Stock removed . . . approx. .040"
*Grinding time . . . . . 3½ hrs.

Tungsten Carbide Tipped Form Tool
Width of carbide tip . . . . . ½"
Depth of cut . . . . . .240"
Stock removed . . . approx. .040"
*Grinding time . . . . . 1 hr.

*Includes setup and complete inspection of contour before removal from machine.

The Wickman Profile Grinder has demonstrated its precision and efficiency in the plants of a number of the country's most important manufacturers. In 1941 it introduced a new method of profile grinding to American industry—a process in which a 50 times size layout, a pantograph system, microscopic inspection, and a universal grinder are coordinated to produce profile grinding to an accuracy within ± .0005". It is now being used to grind flat and circular form tools, punches and die segments, profile gages, special cams, templates and many other irregular parts from a wide variety of materials including tungsten carbide.

The first of these Wickman Profile Grinders were designed and built to conform to basically sound and thoroughly tested engineering principles. With the improvements which have since been made, the present machines offer the utmost in efficient, trouble-free performance.

A completely descriptive folder covering today's Wickman Profile Grinder is yours for the asking.

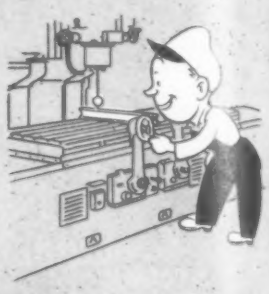
WICKMAN PROFILE GRINDER

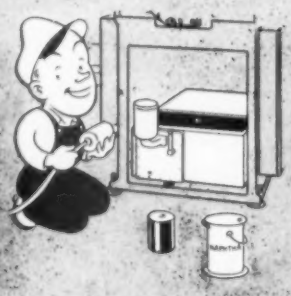
THE Wickman CORPORATION

15535 WOODROW WILSON
DETROIT, MICHIGAN

Follow lubricating instructions. Use oils of recommended specifications. A central lubricating department will do the best job.

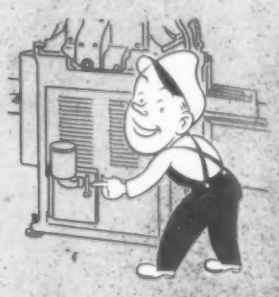
Check the accuracy of level, both table and rear base, at about two month intervals. Accuracy begets accuracy.





Periodically remove and clean all filters; (cloth filtering type for table way oil; metallic type for hydraulic oil; stone filters added for machines equipped with profiling unit.) Wash in naphtha or similar cleaning fluid. Use emery cloth for stone filters; blow out metallic and stone filters with air blast.

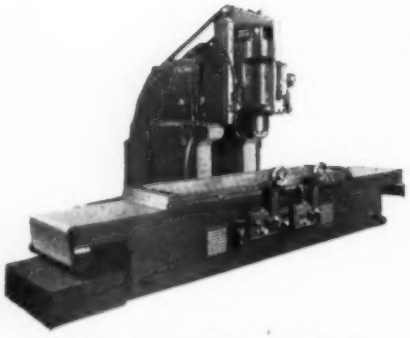
Check oil levels daily and maintain an adequate supply of clean oil in the reservoirs. "Starved" pumps can exert no more effort than starved people.



FITNESS PROGRAM

Keeps Machines Going, Too!

CINCINNATI



●*CINCINNATI 28" Series Vertical Hydro-Tel Milling Machine. A "bear" for heavy stock removal, with a delicate "feel" for accurate die-sinking and profiling jobs. Complete description and engineering specifications may be obtained by writing for catalog M-1018-2.*

● It takes more than steel, aluminum, magnesium and rubber to make fighting and defense equipment. Admittedly, many basic materials are the first requirement, but they must be cut, bent, shaped, moulded, cast and so on by **machines.** And a machine which is out of commission can do no work; the materials remain as inert chunks of matter.

To keep machines in first class operating condition, follow a mechanical fitness program, with dogged attention to basic and seemingly obvious details. Some of the details to keep after on CINCINNATI Vertical Hydro-Tel Milling Machines are tabulated here:

1. ***Level the machine periodically.*** A good rule is to check the accuracy of level every two months, of both table and ram.
2. ***Follow lubricating instructions.*** A lubricating schedule tag tied to the machine will serve as a convenient reminder.
3. ***Use clean containers for oil,*** especially for the hydraulic oil.
4. ***Clean the oil filters periodically.*** This is very important for hydraulic oil filters, both cartridge and stone types.
5. ***When not using power feeds place feed series lever in "SLOW" position.*** Eliminates wear in one spot.
6. ***Always stop spindle drive motor before spindle speeds.*** Save the gears.

These chores are simple and easy to do, and require little time. Make them a habit and avoid the ills fostered by neglect of large hydraulic machines . . . chatter of traveling units . . . inaccurate work . . . low power efficiency . . . uneven traverse . . . no response to movement of levers. Give your Hydro-Tel a break . . . give it a chance to make a production record equal to your attendance record.

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . DIE SINKING MACHINES

INDUSTRIAL NEWS DIGEST

. . . a review of significant developments and new techniques in mass production industries . . .

Fort Wayne, Indiana, Supercharger Plant now in Full Production

Six months after steel was delivered for Fort Wayne, Indiana's mammoth new General Electric supercharger plant, the first carload of completed units for the U. S. Army was shipped. This event, announced late last month, was 60 days ahead of schedule.

The building, largest of the many G E factories and with its equipment representing a Defense Plant Corporation investment of approximately $25,000,000, covers more than 788,000 square feet. In the new shop, a War Department approved statement says, more geared supercharger impellers for high-flying aireraft engines are produced than in any other plant in the United States. It is the only G E plant where turbosuperchargers, a G E developed product, are manufactured under full line production methods. Lisle Hodell, superintendent of the plant, says that current monthly production is at the rate of $3,000,000.

Manpower: Fully 58 per cent of the 3,000 employees engaged in production work in the Fort Wayne shop are women.

"With the exception of a small nucleus of instructors, all these people have been trained within a year for this work, which must be done with a degree of precision far greater than the average machine shop," Hodell explained.

"Each day manpower becomes scarcer but fortunately women are quick to learn and are filling in with very satisfactory results," he added. "Twenty-two weeks from the time we instructed the first woman for a man's war work job, we had completed the training of the 1,000th woman."

National Metal Congress is October Windy City Event

Chicago will play host to the 25th annual National Metal Congress during the week of October 18, the American Society for Metals announced late last month.

"A War Conference Display," the society says, "is an outstanding feature of this meeting of the metal industry." All activities, according to plans, will be concentrated in "Loop" hotels.

Objectives: "All technical sessions and special daily War Production and Conservation sessions will be streamlined and comprehensive in their contributions to the war problems and will contribute decisively and materially to the shortening of the war," A. S. M. Secretary W. H. Eisenman says.

Four national societies will cocperate in the event. Others are the American Welding Society, the Wire Association, and the Iron and Steel and Metals divisions of the American Institute of Mining and Metallurgical Engineers.

Displays and sessions of the A.S.M. will be concentrated in the Palmer House, the A.W.S's at the Morrison Hotel, the Wire Association's at the LaSalle, and the A.I.M.E.'s at the Sherman. The A.S.M. is asking manufacturers to use models, moving pictures, photographs and literature to present new developments.

Tool Conservation Program Launched; Perishable Tool Materials Critical

"Tools are Weapons—Treat 'Em Right!" is the theme of an intensive national campaign which has been launched to promote the conservation of cutting tools.

If some of the campaign material has not already reached your plant it js unusual, for the program is believed more intensive than any yet designed for education on the War Production Front.

Necessitated by the continuing critical condition of cutting tool supplies, this program to stimulate worker interest in the conservation of such tools

(Continued on following page)

His Ideas Save the Nation Millions

Oliver W. Bonnafe, Lapointe Machine Tool Company research engineer, inspects the 37-mm. Broaching Rifling Machine which broaches seven barrels simultaneously.

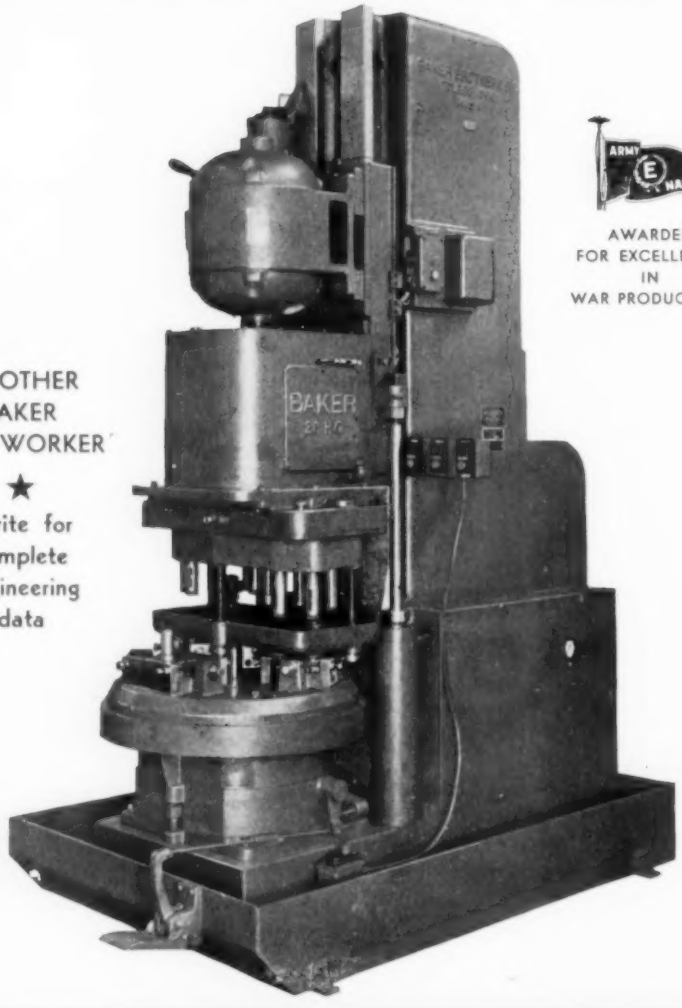
Winner of the National Metal Trades Association medal for special research and manufacturing processes is Oliver W. Bonnafe, Research Engineer, La-Pointe Machine Tool Company. Self-educated and up from the machine shop, Bonnafe's machine tool developments this year are said to have saved the nation more than 20 million dollars, are expected to save 100 million by 1944.

The Hudson, Massachusetts, engineer received the award for his work on an automatic broach rifling machine which performs in one minute what previous methods required two hours to accomplish—broaching, in one high-speed operation, reams, rifles, and finishes various gun barrels ranging from the smallest pistol to some of the larger cannons. This broaching method is amazing in its absolute conformity to standards. It is claimed that vital parts being made do not vary more than .00001-inch.

"GREENIE" T.M. REG. U.S. PAT. OFF. *She's a driver!*

LOOK, ED—YOU'VE BEEN WORKING OVERTIME SO MANY WEEKS YOU HAVEN'T HAD TIME TO SHAVE— NOW, HOW COME I FIND YOU WASTING TIME, AWAY FROM YOUR LATHE?
GOSH, GREENIE, I WAS ONLY BOOSTING MY MORALE BY READIN' TH' SLOGANS!
SOCK THE BUM!
Remember Pearl Harbor
V for VICTORY NOT FOR VACATION
Play Safe
IT'S NO CRIME TO KILL A RUMOR
YOUR ABSENCE MAKES THE WAR GROW LONGER
BUY WAR BONDS
MIXED RIVETS MAKE THE JAP HAPPY!
RALPH DAVIS

BAKER



ARMY E NAVY

AWARDED FOR EXCELLENCE IN WAR PRODUCTION

ANOTHER BAKER WAR WORKER

★

Write for complete engineering data

Model 26-HO VERTICAL CLEANLINE HEAVY DUTY SINGLE AND MULTIPLE SPINDLE DRILL—HYDRAULIC FEED

This versatile BAKER MACHINE is illustrated as set up for operations on guides used on tanks. Drilling operations are handled at the left cutting station, reaming operations at the right cutting station. Two parts are secured at each cycle. • This is a hydraulic feed machine with special 8-spindle fixed center head and 3-station hand index table. All spindles are mounted on ball bearings, with vertical adjustment sleeves in all spindle ends for seating of tools. • A wide range of speeds is available—all controls are convenient to the operator. Readily changed over for work on many other types of parts. Special fixtures and special multiple head are furnished by Baker Brothers, Inc.

Baker Brothers, Inc.

Single and Multiple Spindle Machines for DRILLING • BORING • FACING • TAPPING

Toledo, Ohio

is sponsored by WPB's Conservation Division, with the assistance of the National Industrial Advertisers Association whose members advertise in the pages of this magazine.

With the government's assistance, one of the nation's leading industrial advertising agencies has prepared a special handbook which is designed to crystalize the effort. The book, entitled "Government Campaign for the Conservation of Cutting Tools," explains the need for the campaign, how wastage can be reduced, and outlines the program designed to alleviate an imminent production slowdown as a result of greater shortages in cutting tools later this year.

This poster message is the central theme of current tool conservation campaign sponsored by WPB and industrial advertisers.

Situation Critical: The extent of the campaign preparation indicates the seriousness of the situation. Highlights include articles on tool conservation for industrial magazines, news releases, special articles and cartoons promoting conservation in the labor press; special material by the Office of War Information for industrial house organ editors; posters for shops and promotional programs for manufacturers' associations, trade and management organizations.

Basic objective of the campaign is to establish tool conservation as a definite policy in plants; not as a management edict, but as a cooperative effort on the part of labor and management.

The underlying thought which WPB and industrial advertisers are trying to get across is: "A complete job cannot be considered well done—if a tool has been needlessly spoiled in the process."

Tool Outlook: That the high loss of cutting tools resulting from misuse by inexperienced workers can and must be reduced through shop education is a fact the WPB's Tools Division has been trying to pound home for months.

"Cutting tools are now being used by approximately 10,000,000 war workers, many of whom never before handled such tools," the WPB said recently. "Deliveries of these tools are approximately four months behind schedule. With the demand greatly outstripping the supply, every tool that is brok-

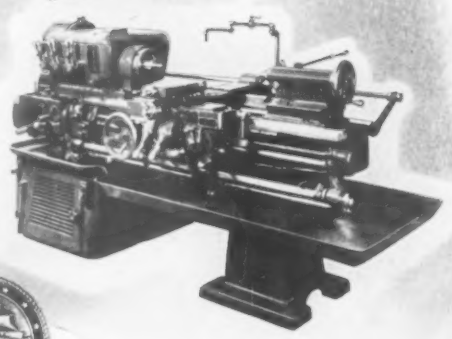
(Continued on page 128)

Double Duty in YOUR TOOL ROOM

. . . with the Lodge & Shipley Universal Relieving Attachment . . .

All the usual jobs, PLUS the ability to do—end, internal, external, plain, angular, or spiral relieving work. Investigate these advantages.

END RELIEVING



PLAIN RELIEVING

Since March 6, 1942

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

(Continued from page 126)

en or dulled through careless handling means less war production. Workers can make a direct contribution to winning the war—over and above their regular tasks—by learning how to take care of these tools."

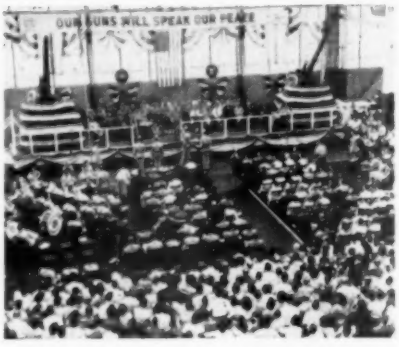
Cutting tools are perishable even under normal conditions and their lives have been shortened by the high speeds and heavy feeds of war production. There has always been some preventable loss but the loss is now very great because millions of newly recruited workers have not learned the rules that are second nature to experienced workmen.

Cutting tool production for 1942 amounted to $400,000,000. At the turn of the year the backlog on hand was valued at $130,000,000. It is estimated that production will have to be raised to about $500,000,000 this year to meet demands. The cutting tool bottleneck is not in production factories, but shortages of high speed steel, tungsten, cobalt, molybdenum, and chromium.

Everyday rules which production men have failed to emphasize strongly enough to new workers, the WPB says, include changing tool bits before they get too dull; using guides to locate jig-holes; keeping spacing collars clean and parallel, and above all, putting tools away carefully.

It is estimated that widespread adoption of tool-tipping practices could mean a saving of 75 per cent of the 36,000 tons of "tippable" tools it is believed will be needed in 1943. Techniques for extending tool life and "tipping" have been detailed frequently in The Tool Engineer.

The South Produces For Victory



Rear Admiral F. L. Reichmuth, Commandant of the Navy Yard and Superintendent of the Naval Gun Factory, Washington, D.C., presents an "E" in the Westinghouse operated Louisville plant.

The economic transformation and growing industrial might of the new South was dramatized in an Army-Navy "E" Award ceremony in Louisville, Kentucky, June 22.

Just Beginning: On a site only two and one-half years ago an open field, the Westinghouse Electric and Manufacturing Company accepted a burgee for outstanding work in its Naval Ordnance Plant in the Ohio River city.

Production-wise James R. Weaver, manager of the plant, pledged that "we have just begun to produce," and recounted that operations in the vast shop started only 20 months ago.

Business Notes from Industry: Purchases, expansions and new services

New Company: The metallurgical laboratories of Lucius Pitkin Inc., New York City, are now operated as the laboratories of Sam Tour & Company, Inc. Lucius Pitkin Inc. will continue as analysts, assayers, chemists, consultants, spectroscopists, weighers and samplers, and shippers representatives catering to mining and metallurgical industries. The new concern will work as consultants, engineers, metallurgists, metallographers, radiographers, research development and testing laboratories for clients previously served by the discontinued departments of Lucius Pitkin Inc.

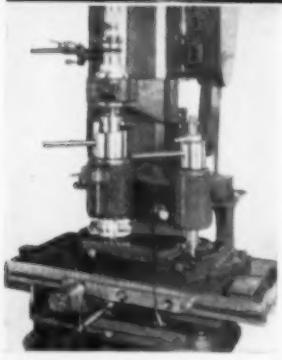
* *

Acquisition: Domestic Industries, Inc. last month announced the acquisition of Siewek Tool Company, Ferndale, Mich.; Siewek Tool & Engineering Company, Hartford, Conn.; and Progressive Tool & Cutter Company, Ferndale, Mich. The parent concern's Chicago office announced that the business of Siewek Tool Company and that of Progressive Tool & Cutter Company will hereafter be carried on by the Siewek Tool Division of Domestic Industries, Inc. The business of Siewek Tool & Engineering Company, it was said, will be carried on under the name of Siewek Engineering Division of Domestic Industries, Inc.

* *

New Plant: In a new, modern plant, the Onsrud Machine Works, Inc., Chicago, has commenced production of router bits and cutters of all types and

(Continued on page 130)



Above: Five of a large battery of BARNESDRIL *Honing Machines for honing various parts of aircraft radial engine.*

Aircraft Connecting Rods Honed to Limits of 0.00025"

A prominent manufacturer has installed a large battery of BARNESDRIL Honing Machines for honing various parts of an aircraft radial engine. The close-up view at the left shows the fixture set-up for honing the crankshaft bore and the wrist pin hole in the connecting rod. The rod is honed before and after hard chrome plating and held to limits of 0.00025". Other machines in this factory hone cylinder barrels, articulating rods, six radial arm holes in propeller shafts, valve guide bushings, counterweights, rear end crankshaft, and supercharger housings.

Honing is Adaptable to Many Bores

BARNESDRIL Honing Machines are made in vertical, horizontal, and angular types, with one or more spindles, for honing the interior of any bore, requiring smooth, accurate finish. These honers are made in a wide range of sizes to handle work up to more than forty-two inches diameter and lengths to seventy-five feet or longer.

BARNESDRIL engineers will be glad to recommend the proper type and model of honing machine for your specific production requirements. Send blueprints of parts for analysis and suggestions. No obligation.

Free Honing Data

Here's a valuable booklet with complete details of the "Honing Process" and our entire line. Write for free copy of Honing Process Bulletin No. T-121.

Barnes Drill Co.

848-71 CHESTNUT ST.

ROCKFORD ILLINOIS, U.S.A.

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS BRAKES SHEARS

Shaping a 10,000 lb. Plate

The Shaper is recognized as indispensable in the toolroom—but many manufacturing jobs are best performed on Shapers. Whether shaping slots in a 10,000-lb. plate or contouring small parts, the power and accuracy of Cincinnati Shapers will meet your requirements.

Write for Calalog N-2

WE HAD A HAND IN IT

Who was responsible for the astounding speed with which industry converted itself into a new production machine? . . . who showed the way to the producing of the great quantities of war materiel in the record time that was demanded by the government? . . . who developed the new tools, dies, and fixtures that were required? . . . and the new processes?

The engineer.

We wish we could tell you how much of this responsibility came to us here at Pioneer . . . how much of the work has been done, and how much is still going on. As you can well imagine, most of the work involved problems much different from any that have ever been encountered before . . . new products were needed, and new ways of making them had to be developed . . . new materials were introduced to displace the old.

You can readily picture what a wealth of engineering data has been accumulating in this procedure; and you can realize, too, that the opportunity to draw on this valuable experience could prove most helpful to your interest.

That opportunity is yours . . . we shall be glad to work with you on your present problems . . . or discuss your future plans with you.

BUY WAR BONDS

ENGINEERS
DESIGNERS
CONSULTANTS

PIONEER ENGINEERING AND MANUFACTURING CO.

19645 JOHN R
DETROIT 3, MICH.

(Continued from page 128)

sizes. The new plant, it is said, multiplies many times the concern's capacity for cutting tool manufacture, and speeds delivery on tool orders for Onsrud wood and metal working machines. All steps in router bit and cutter production are performed in the new shop.

* *

Employee Relations: Tomkins-Johnson Company, Jackson, Mich., machine and tool manufacturers, now provides four-way protection for its employees including life insurance, accident and sickness coverage, and employee and dependent benefits for hospitalization and surgical operations. Employer and employees share the cost.

* *

Anniversary: Lemco Products Incorporated's 25th, celebrated in Cleveland late in June with more than 800 employees, stockholders and friends attending. In addition to material used directly in the war, the company's production includes a large line of machine tools. For the past two years Lemco has been importing the entire production of shapers made to its specifications by an Argentine plant.

* *

Purchase: Quimby Pump Company, with plants at Newark and New Brunswick, New Jersey, by H. K. Porter Company, Inc., Pittsburgh. Manufacturers of a full line of industrial pumps, Quimby now is at work for both Navy and Maritime Commission. The Quimby plants will operate as divisions of Porter, a manufacturer of industrial locomotives and chemical processing equipment.

* *

New Die Maker: Formation of Algoma Products, Detroit, to manufacture "template dies" and fixtures for aircraft and similar industries has been announced by L. Hoster, General Manager. The concern has two plants in the Motor Capital. It estimates its methods will cut die production time 75 per cent and reduce costs 65 per cent.

* *

Name Change: In announcing the change in firm name from Hub Tool Company to Archer & Smith, Ltd., Frank Archer and G. R. Smith, general partners, emphasized the fact that there has been no change in personnel or products. The firm's Lexington, Kentucky, plant is credited with pioneering in the employment of women in volume production of cutting tools.

* *

Expansion: Clearing Machine Corporation, Chicago, pneumatic and hydraulic press manufacturer, has completed a new assembly building.

* *

Name Change: York Ice Machinery Corporation to York Corporation as a result of a merger and recapitalization. York is a volume producer of refrigeration and air conditioning equipment.

* *

New Plant: Aircraft Accessories Corporation's ninth will soon be opened in Kansas City.

Oil company establishes industrial safety record

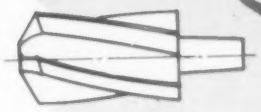
Industrial safety news is being made by employees of Standard Oil Company (Indiana), who are producing petroleum products for World War Two with 83 per cent fewer accidents than were prevalent in War One days.

(Continued on page 132)

MIDWEST Core Drills

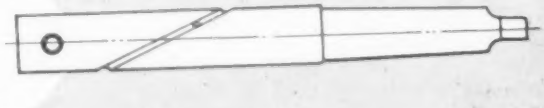
FOR ENLARGING DRILLED, PUNCHED FORGED OR CORED HOLES

HIGH SPEED DRILL TIP
STYLE NO. 410
Sizes: ⅝" to 3"



PLAIN CORE DRILL HOLDER
STYLE NO. 1410
Recommended for relatively shallow work with drill tips ⅝" to 1 15/32" dia.

PILOT BEARING CORE DRILL HOLDER
STYLE NO. 1415
Designed for operation through jig bushings with drill tips 1" to 1 15/32" dia.



FLUTED CORE DRILL HOLDER
STYLE NO. 1420
Recommended for deep hole work with drill tips 1½" to 3" dia.

SAVES VITAL HIGH SPEED STEEL

MIDWEST DRILL TIPS are made from selected high speed steel; Midwest Holders are made from tough alloy steel. This combination of Tip and Holder saves vital steel by taking the place of solid high speed core drills which are costly and often quickly go undersize. Midwest Tips can be ground many times before replacement is necessary and when worn out a new one can be inserted in the original holder without removing the holder from the machine.

These core drills and holders are provided with the rigid and accurate Midwest Taper and Pin Drive, and the combined Tip and Holder has all the advantages of a solid steel drill.

Midwest Core Drills are furnished to fit plain, piloted type or fluted type holders as illustrated above. Further information on Midwest Core Drills and other Precision Metal Cutting Tools is contained in Midwest Catalog 17.

MIDWEST TOOL & MFG. CO.
2364 W. JEFFERSON AVENUE, DETROIT 16, MICHIGAN

MIDWEST

Engineers and Manufacturers of Precision Metal Cutting Tools which contribute to the progress, prosperity and comfort of mankind

MILLING CUTTERS • SLEEVES • COUNTER BORES • END MILLS • REAMERS • SPECIAL TOOLS • FORM TOOLS CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

ANOTHER EXAMPLE OF *JOB TESTED* MIDWEST TAPER AND PIN DRIVE

(Continued from page 130)

Safety Pioneer: This fact was announced last month by Company President Edward G. Seubert in connection with observance of the 25th anniversary of the beginning of systemized safety work in the organization. On July 8, 1918, the company established in its Whiting, Indiana, refinery the first safety department in the petroleum industry.

While accidents in industry generally showed an upturn in 1942, Standard of Indiana had its best year with fewest casualties, Seubert's figures showed. In its manufacturing department there were only .81 accidents per million man-hours worked.

Last year Standard's Wood River, Illinois, refinery claimed a safety record for the industry by working 6,879,296 man-hours without a disabling injury.

Aircraft Manufacturing: All-Woman Plant; Nash Tools for Helicopters

Old-time production men, brought up to believe that woman's place is in the home, were jarred last month by news of an aviation plant utilizing women 100 per cent in its basic manufacturing operations. The plant is the Northern Aircraft Products Division of the Aviation Corporation, Toledo, Ohio. Its products: engine and propeller parts.

Results: As Northern Aircraft builds its production up to maximum capacity, the 100 per cent use of women in basic operations will be maintained, AVCO Executive Vice President W. T. Wise stated, because in the future, as well as now, men will be employed only as job-setters, supervisors and instructors.

This exclusive use of women on production work is unique in that the whole factory setup has been developed from the beginning on the basis of 100 per cent women for that work. The success of the women in handling the most exacting machining operations at Northern has completely justified the decision, AVCO says.

The all-woman factory force has been developed by Plant Manager W. R. Hamilton and General Superintendent John McLachlan in Northern's four-story factory, a building formerly occupied by Willys-Overland Motors. Hamilton and McLachlan are veterans of the Republic Aircraft Products Division in Detroit, of which the Northern Aircraft factory serves as an extension.

* *

Nash: Late in June the automobile industry cut itself another slice of the nation's biggest war production job—aircraft manufacture—when George Mason's booming Nash-Kelvinator Corporation grabbed the interesting job of mass-producing helicopters.

Designed and now being built by the Sikorsky Aircraft Division of United Aircraft at East Hartford, Connecticut, the flying pinwheels are for the Army. This makes the third product of United Aircraft to be built under license by the Detroit auto and refrigerator manufacturer.

Mason has announced that the final assembly work will be done in the Motor Capital, although both Milwaukee, Wisconsin, and Grand Rapids, Michigan, plants of the company will produce parts. Extensive special tooling is now under way, Nash engineers tell us.

Ray A. De Vlieg, newly appointed vice president in charge of manufacturing for Nash-Kelvinator, said that "because the company is starting from scratch on this, the first large scale production of helicopters, it will be several months before we can hope to have finished products coming off the line."

Motor Manufacturing Memos: Production Still Rising; Time-Saving Tools

Despite counter national trends, war production in the automotive industry in June rose to a total of $725,000,000 compared with $705,600,000 in May and $672,000,000 in April.

June delivery was at an annual rate of $8,700,000,000, the highest rate of productivity in auto industry history. The June increase in production is up 89 per cent over a year ago, while the May figure showed a 125 per cent increase over May, 1942.

* *

Last month this department reported details of the auto industry's second conversion since Pearl Harbor. A few days ago the Automotive Council for War Production (wartime version of the Automobile Manufacturers Association) took formal cognizance of this fact and revealed some startling facts and figures.

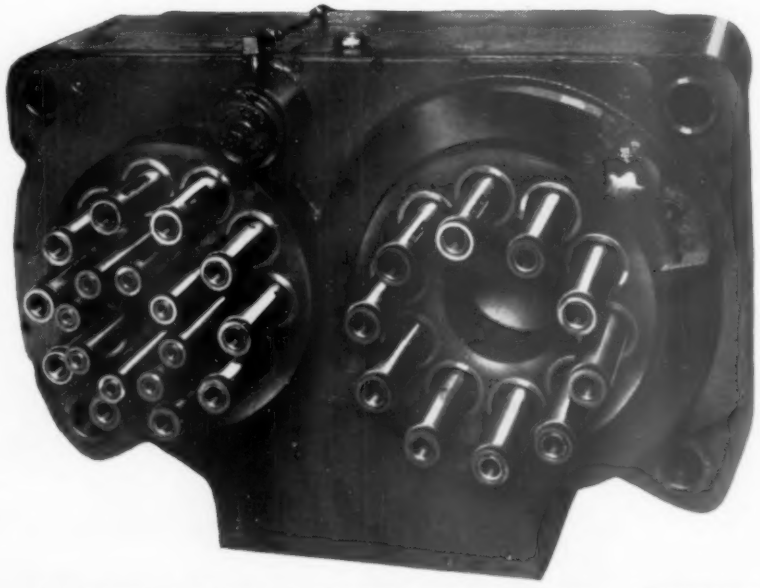
Said the Council: The industry's production today stands at eight billion dollars annually, is rising daily.

(Continued on page 134)

Let Buhr PATENT solve your special drilling problems with multiple spindle heads like this

28 - SPINDLE BUHR INDEX DRILLING and REAMING HEAD

- Vertical adjustment in spindles to lengthen drills.
- Group of ten spindles, index eighteen degrees, to countersink holes in mating part.
- Oil pump for positive lubrication.
- For drilling, reaming and countersinking all holes in wheel hubs.



BUHR MACHINE TOOL COMPANY ANN ARBOR MICHIGAN

SPECIALISTS IN MULTIPLE SPINDLE DRILLING, BORING, REAMING AND TAPPING EQUIPMENT

A BIRTHDAY STATEMENT ABOUT "MX" WHEELS

THE announcement of "MX" Wheels in 1942 introduced a new abrasive tool to industry.

These wheels were created by Carborundum to perform a specific function—the removal of "disturbed metal" such as burrs and tool marks, resulting from grinding, machining, boring and similar operations.

Research and field tests showed "MX" Wheels could do this job better than ordinary finishing methods. A year's experience has confirmed their advantages.

"MX" Wheels, fabricated from cotton fibre intermingled with abrasive grains are unlike any other abrasive product. They have unique characteristics.

Because of their "cushioning" effect "MX" Wheels literally hug the work. Chatter and vibrations are reduced, smooth finishes assured.

"MX" Wheels are best suited for breaking corners, removing burrs and polishing grooves or slots. For burr removal on jobs where surrounding surfaces must be kept free of abrasive marks . . . or for polishing which must be done with light stock removal to maintain tolerance limitations . . . they are ideal.

A request addressed to us, Dept. T, at Niagara Falls, will bring you literature further describing the wheel and illustrating a few of its many uses.

CARBORUNDUM
REG. U. S. PAT. OFF.
ABRASIVE PRODUCTS

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

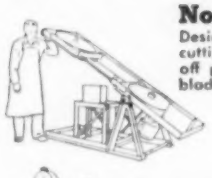
Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company)

It's a fair question

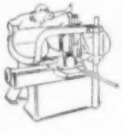
WHY GET A WELLS NO. 8?

Here's why!



No. 20
Designed for cutting risers off propeller blades

No. 9
General Foundry Saw



No. 12
Heavy duty production Saw

STOCK STANDS
Indispensable item for your shop

VERSATILE — Wells No. 8 Metal Cutting Band Saw will cut a wide variety of metals in various shapes. In single or ganged-up work it will take overall sizes up to 8" x 16" rectangles or 8" rounds.

ACCURATE — Vibrationless operation assures uniform cutting.

FAST — The continuous cutting method employed insures a cool blade thus enables the operator to obtain maximum cutting speed for the type of stock being cut. Adjustable to 3 speeds.

ECONOMICAL — Cutting capacity and quality are paramount factors in choosing a Wells Saw. Then too, it requires but a ½ H.P. motor and 2' x 6' of floor space.

Ask your mill-supply dealer to show you a WELLS, No. 8, in actual operation — you'll like its performance.

SPECIFICATIONS WELLS No. 8

Capacity: Rectangle	8" x 16"
(Spec. bowed guides)	5" x 24"
Rounds	8" dia.
Speeds: ft. per min.	60, 90, 130
Motor	Specifications optional

Wells Has Established Leadership

To get complete specifications on WELLS Saws, write for the new WELLS Catalog.

A large stock of blades is available at all times

WELLS MANUFACTURING CORPORATION
Wells METAL CUTTING BAND SAWS
1212 MONROE ST. • THREE RIVERS, MICHIGAN

Employment exceeds 1,2[illegible]000 workers, is now 75 per cent abo[illegible] the peacetime level, and will approx[illegible]ate 1,500,000 men and women next [illegible]ng.

Dollar volume has reache[illegible] a figure nearly double the norma[illegible] peacetime figure, and a 10 billion dollar annual volume is not many months away.

The shifting goals in war production are best reflected in the Motor Capital's tank arsenals, still in a declining phase of operation. Some tank lines have been shut down, others have lopped off a shift, all have reduced their production schedules.

Schedules are down in gun plants, particularly anti-aircraft and some machine gun shops.

Truck manufacture is past its peak and idle equipment is awaiting the government's "go" signal on limited civilian production.

Aircraft engine output has reached the point where motors are awaiting airframes and most producers are coasting.

Yet, overall production in 825 auto industry plants is rising. Aircraft, aircraft parts, and, to a lesser extent, shells, accounts for the increased output.

Though the Controlled Materials Plan is said to be working better for the auto men, they still face shortages in aluminum forgings and extrusions. This situation is serious.

* *

Fisher: A lubri-spray gun that enables a machine oiler to more conveniently lubricate press gears has found a four-fold purpose at G M's Detroit Stamping Unit of the Fisher Body Division. Such a device could be built by other plants where gears of large presses must be lubricated constantly. Primary object of the grease container is saving time. It is so constructed that the oiler can carry it over his shoulder by a sling, enabling him to climb a ladder instead of waiting for a crane to lift his greasing equipment up to him in order to reach the gears.

The lubricating gun is made of two three-quart light metal grease containers, fitted with easily fashioned and removable lids. The center of each lid has a .375-inch pipe thread opening for like-size pipe bushing. The bottom of the containers has a .75-inch pipe thread opening for a similar size bushing. A metal follower is used to follow grease through the container. Gun nozzles and air control fittings can be secured from plant supplies.

Plant officials say the gun has led to increased efficiency, more convenience for the oiler, saving of time usually lost by machine oilers waiting for die and production men to release a crane and also the saving of time usually lost by die and production men waiting for the oilers to release the crane.

Another time saver: A saving of 10 to 15 minutes in one machine operation by utilizing two hacksaw blades for cutting out a test bar has been devised in naval gun production at another Fisher Body Division plant. Use of the two hacksaw blades grew out of a steel crib employee's suggestion of installing an adapter to raise a hacksaw blade so that a larger piece could be placed under the hacksaw. The adapter allowed the workmen to cut the test bars more rapidly and led to the setting up of two hacksaw blades to operate simultaneously.

THE END

(Army-Navy "E" Awards on page 200)

Information supplied by an Industrial Publication

Tool breakage—even in what was once considered "normal amounts" is something to be avoided by any means today. Replacement supplies are hard to get, and the possibility of tool shortages is too serious to permit temporizing.

In many cases breakage can probably be considerably reduced by educating operators in the proper use of cutting tools. In some instances, redesign of the tool may be the remedy.

Redesign was the solution in the case of countersink drill bits used in an aircraft factory. Bits having cylindrical pilots often broke when the center line of the bit was at an angle with that of the drilled hole. Run out in the spindle could easily cause such deflection.

The remedy suggested by an employee consisted of equipping bits with a spherical, or ball shaped, pilot. Such a pilot has the effect of making bits self aligning. Deflection through a relatively wide angle cannot concentrate enough stress at the neck of the pilot to cause breakage, because the end of the bit is not rigidly held.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-lyb-den-um Company

500 Fifth Avenue • New York City

MOLY

... CAPITAL COMMUNIQUE ... BY ... JAY A BONWIT = WASHINGTON

T. M. REG. U. S. PAT. OFF.

Special dispatch from THE TOOL ENGINEER'S *correspondent in the nation's capital.*

● A tug of war is developing on the question of how much civilian goods can be produced during the last quarter of this year and next's first quarter.

There is idle metal working plant capacity which was not adaptable to war production and, in addition, war requirements for metal are becoming increasingly specialized, with processors in some fields finding their products in less demand.

Net result is pressure from these quarters seeking diversion of materials to civilian goods.

The WPB Office of Civilian Requirements is formulating a civilian program calling for the allotment of a considerable tonnage of metal to so-called essential durable goods production.

This program will be taken under consideration by the WPB Requirements Committee, and will be screened of practically all metal except for repair and maintenance requirements, and a small quantity of utility goods. The Requirements Committee policy will be to allocate first tonnages of metal which can be diverted from war production to the replacement of railroad rolling stock and rails, and to public utilities requirements. Allocation of metal to farm machinery production is likewise considered a necessity, and is classed along with direct war production needs for the military.

* * *

CIVILIAN PRODUCTION AGENCY

Result of this action, which in effect will continue the process of squeezing down the war economy, will be a severe reaction from Congress. Charges that the Army has been hoarding and misusing equipment will likely be forthcoming, and pressure will be built up for the enactment of the congressional bill calling for a separate civilian agency. The latter process will probably be projected well into the latter part of this year, with final action dependent upon the war outlook at that time.

* * *

MACHINE TOOL RESTRICTIONS

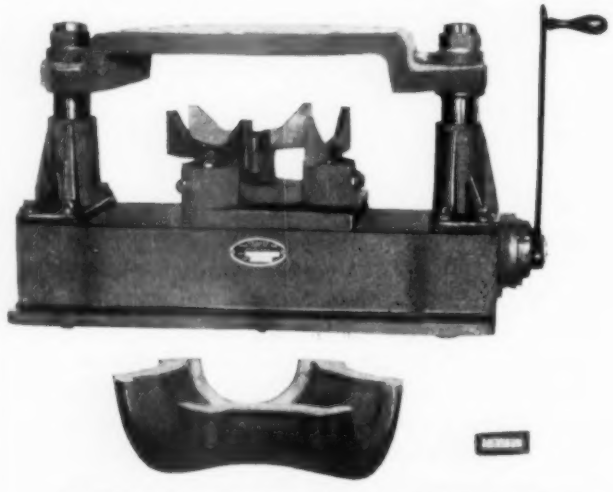
Further restriction on issuance of military and Government purchase of capital plant equipment and machine tools was imposed by WPB Executive Vice Chairman Charles E. Wilson in "Directive 23", effective July 15.

While WPB has been screening military and Government approved orders for capital equipment and machine tools, the process has been loose, and has largely been in the nature of a formality.

The new Directive sets up a specific procedure and conditions under which WPB will review issuance of priorities by the Army, Navy or other Government agencies, and approve the placement of certain purchase orders rated by such agencies.

Every Preference Rating Certificate on Form PD-3A (the Governmental rating form), which assigns the rating to delivery of capital equipment or machine tools (whether such delivery is to be made directly to the Army or Navy or other Government agency or to a prime or subcontractor thereof), must be endorsed by a duly authorized official of the War Production Board. The only exceptions are: (1) where the order involved does not exceed $500 in value; (2) where the order is placed

(Continued on page 138)



FIXTURE TO DRILL SIX HOLES IN PROPELLER HUB. PART LOCATES ON EQUALIZING VEES AND SQUARES UP TO THE TOP PLATE

SWARTZ

STANDARD FIXTURES

STILL AVAILABLE ON

SHORT NOTICE

SPEED UP YOUR

TOOL DELIVERIES BY

SAVING IN DESIGN

PATTERN & CASTING DELIVERIES

ASK FOR CATALOG No. 941

SWARTZ TOOL PRODUCTS CO., INC.

13330 FOLEY

Detroit, Michigan

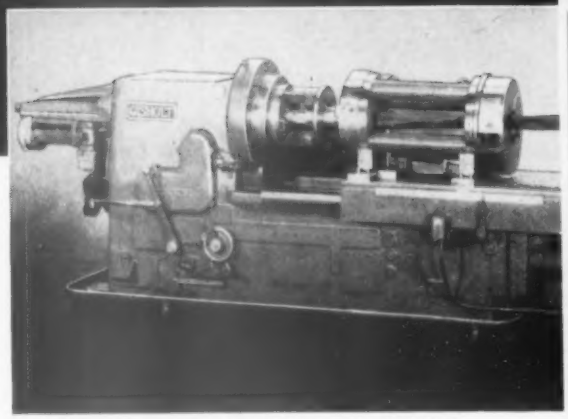
Represented by

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Houston—Engineering Sales Co.
Beverly Hills, Calif.—Criterion Tool Sales
Chicago—Ernie Johnson
Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.
Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.

Make it fit to fight!

WE REVVED UP PROP *Production,* TOO!

WITH GISHOLT SIMPLIMATICS



Hub ends of these steel propeller blades are machined both inside and outside by revolving tools on this special Simplimatic set-up, designed by Gisholt. With automatic feeds, speeds, and retraction of tools, very little operator training is required. Complete information on request.

Now, the principle of a stationary work piece machined by revolving tools has been applied by Gisholt to the automatic lathe. The special Simplimatic arrangement shown below is now used to speed up the production of propellers for Uncle Sam's war birds.

The engineering skill to solve all kinds of machining problems in a way that saves time and cost is the reason why leading concerns bring such special problems to Gisholt.

GISHOLT MACHINE COMPANY
1229 Washington Avenue, Madison, Wisconsin

Look Ahead...Keep Ahead...with Gisholt Improvements in Metal Turning

The Army-Navy "E" and the Treasury Flag fly side by side at Gisholt.

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

(Continued from page 136)

outside of the United States or Canada; (3) in the case of a military emergency where the degree of urgency is such that advance approval by WPB cannot be obtained.

The Directive provides that a purchase order for equipment under the PD-3A procedure must be signed by the appropriate service officer, and then submitted to the nearest WPB field office within whose jurisdiction the tools or equipment are to be located.

The action further provides that the WPB official may authorize the purchase only after "he has determined that the item or items requested are required and that no suitable existing equipment or subcontracting facilities are available, or that the availability or unavailability of such equipment or facilities cannot be ascertained within 10 calendar days" after receipt of purchase request from the service purchaser.

* * *

APPEAL MACHINERY PROVIDED

Appeal machinery from unfavorable action by WPB field offices is provided, but the general objective of the order is to further tighten up procedure under which new capital equipment and machine tools may be purchased.

The action is based on reports that one of the major problems in tools and equipment shortages is mal-distribution, rather than any overall shortage.

Emphasis will be placed increasingly on redistribution of machine tools and cutting tools, in an effort to bring manufacture into relation with present needs.

The armed services and Selective Service are fully aware of the impact on production of any large scale draft of Pre-Pearl Harbor fathers and from the current picture it is not likely that fathers will be drafted this year.

Statistics released recently indicate that such a draft will not be necessary through October, and at that time a further means of staving off the draft may be found.

Facts are that the military is seeking younger men, and that the average age in the armed services is 24 years of age. This is the age where rejection rate for physical disability is lowest, and there is the least likelihood of need of payment of veterans' disability claims after the war.

* * *

ORDERS FOR INDUSTRY

Recent actions of importance to production engineers follow:

June 18—Decline in domestic lead production, due primarily to manpower shortage and transportation difficulties, is eating into the nation's lead stockpile, according to a WPB statement. This counteracts the impression that there is a plentiful supply of lead.

June 21—Conservation Order L-221 was amended by WPB, so that purchasers of machinery into which is incorporated a special electric motor or generator need no longer file a certification setting forth the use and purpose of the motor or generator.

June 28—Office of Price Administration issued specific dollars-and-cents maximum prices for ferro-manganese and manganese alloys and metals.

June 29—WPB issued Conservation Order M-161 as amended, waiving inventory restrictions on lead. Objective is to facilitate movement of lead over crowded transportation lines during months of lightest traffic.

July 1—Manufactured crude abrasive and abrasive grain were brought under control by issuance of an amendment to Conservation Order M-319.

* * *

July 5—WPB amended General Preference Order E-1-b, in an effort to establish a more effective, simple method of allocating machine tools to foreign purchasers and domestic purchasers other than those obtaining these tools through the armed services. The action also is designed to prevent the delivery of machine tools to distributors for stock on a consignment basis.

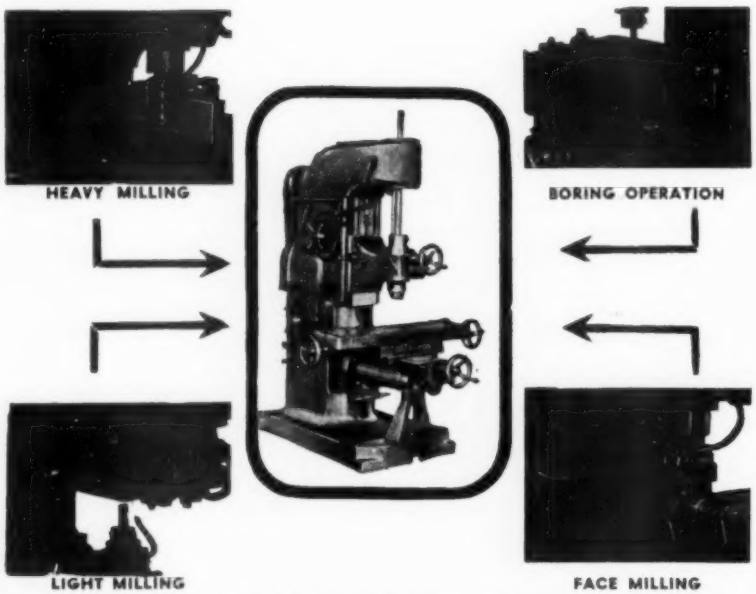
July 12—Limitation Order L-298 issued, setting up procedure for establishing a nation reserve pool of used idle resistance welding equipment, by requiring owners of such equipment to register it with WPB. Objective is to tap used idle equipment before new equipment can be purchased.

July 20—OPA issued Maximum Price Regulation No. 1 (amplification of the first price schedule issued by OPA), revising, strengthening and expanding price control over second-hand machine tools. The regulation, among other things, reduces the maximum prices for machine tools which are not rebuilt. The regulation was effective July 26.

THE END

VERSATILITY COUNTS!

Here are 4 Operations... From 1 Machine

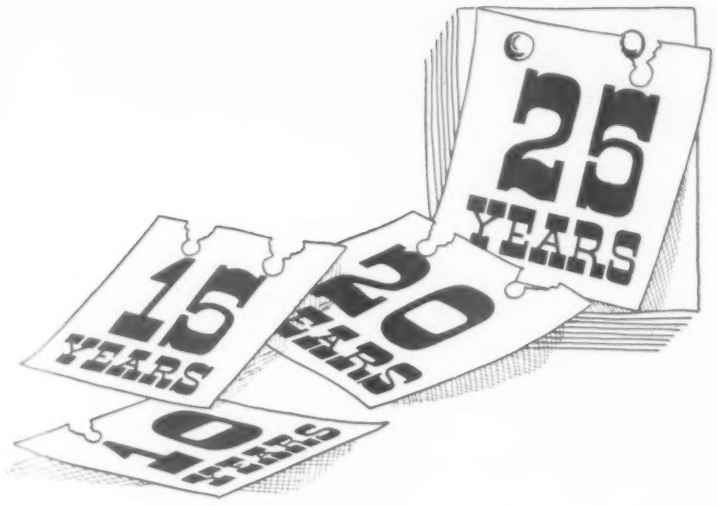


THE KNIGHT MILLER

The Knight Miller is versatile because it does light and heavy milling, facing, and boring—and is accurate to the thousandths in every operation! Furthermore, the need of costly fixtures, special angle plates, and angle cutters is eliminated through the use of the swivel and tilting table features. Write today for complete information.

W. B. KNIGHT MACHINERY CO.
3920 WEST PINE
SAINT LOUIS, MO.

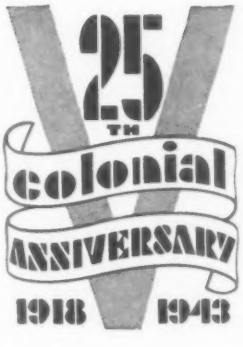
36 Years A Builder of Quality Milling Machines



Remember 1918?

Offhand you may not remember much of 1918 except that this was the year in which the first world war ended.

The chances are that you won't remember that that was the year in which modern high speed steel broaching was born—with the founding of Colonial Broach Company.



Few people cared—few realized the tremendous impact this new development would have on the future of metal working.

As a matter of fact it is our belief that few realize even today the place that broaching already occupies and will occupy in the near future—as the fastest and most accurate method of performing thousands of machining operations.

As a guide perhaps to the future, whether it be for war or for the peace to follow, Colonial has recorded in the Silver Anniversary issue of Broaching News the history of modern broaching development.

We would like to send you a copy. Ask for Broaching News Vol. V No. 3.

Originators of H. S. S. Broaching

colonial BROACH COMPANY

DETROIT 13, U.S.A.

25th Anniversary

Broaches Broaching Machines - Broaching Equipment

BUY U.S. BONDS STAMPS

Faster, Finer Finish..

... Precision Holes with WETMORE TOOLS

ON the basis of production savings, Wetmore Reamers and Boring Bars have proved in industry that quality tools are the most economical. And in these days with manpower and machine capacity at a premium, it is even more important to turn out precision work, with finer finish, in less time.

Wetmore tools speed up machining, cut manhours per piece, last longer, and reduce setting time and maintenance; by a combination of engineering features found in no other reamers or boring bars.

Rigid construction with patented blade lock and extra heavy blades in Wetmore Reamers insure better finish, without digging in or chatter . . . work is held to close tolerances because threads are milled on centers, blade seats ground true with threads and blades are always bottomed . . . blades are quickly and accurately set to the thousandths of an inch . . . blades may be set out 7 to 50 times, depending on size . . . tools are interchangeable, because of Wetmore precision inspection . . . and heavier cuts may be taken because of rugged construction, scientific grinding and quality materials.

Top-flight metal working plants have found Wetmore Reamers and Boring Bars the answer to production problems.

Let us show you how they can solve yours

TOOL ENGINEERING SERVICE

Designers and tool engineers are invited to avail themselves of our consulting service on reaming and boring operations, whether requiring standard tools or tools of special design.

The two illustrations at the top of the page are Wetmore standard boring bar and adjustable heavy duty reamer. In panel: Extra heavy duty reamer . . . special reamer for two operations . . . standard cutting tool unit for boring bar.

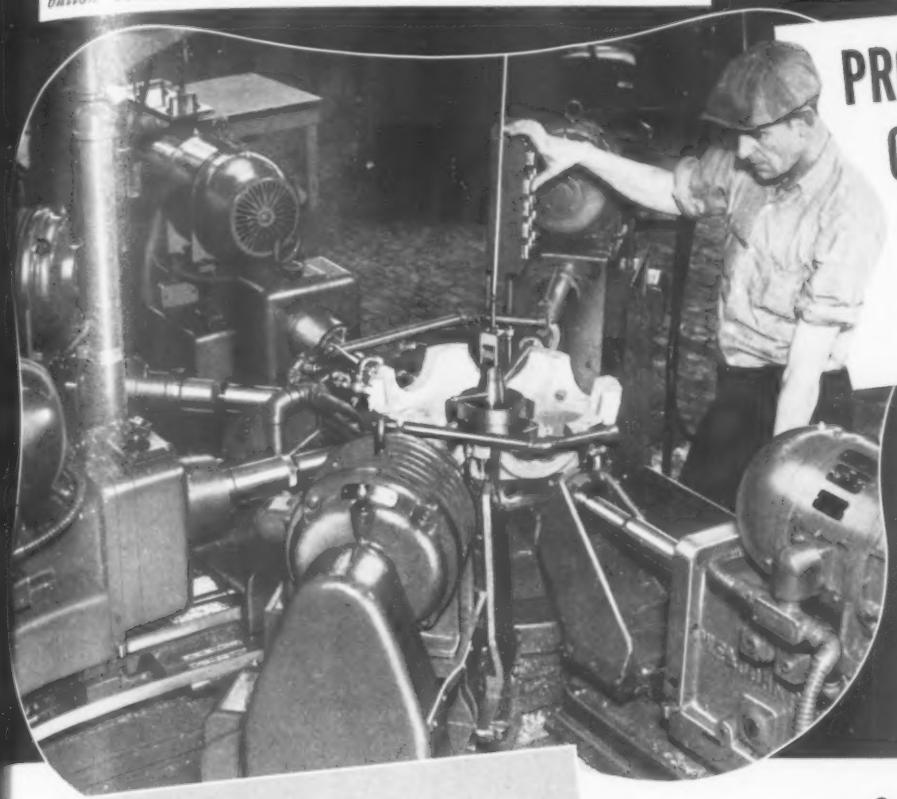
●

Do you have the Wetmore Reamer Book, illustrating standard and special setups? Ask for Catalog 36A.

WETMORE REAMER COMPANY
418 North 27th Street, Dept. C
Milwaukee, Wisconsin

REAMERS and BORING BARS

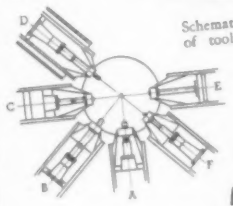
Operator merely loads part and controls entire machining by push-button control. See data below on tooling and operations.



PRODUCTION INCREASED OVER ELEVEN TIMES on Airplane Engine Part

SIX HOLES MACHINED SIMULTANEOUSLY... OPERATIONS INCLUDE DRILLING, SPOT-FACING AND TAPPING.

View showing arrangement of six units for performing operations listed below.



Schematic diagram (plan view) of tooling used on six-way unit-type machine. Operations performed by each unit are listed below.

PART TOOLING AND OPERATIONS

NO. OF SPINDLES — SIX.
UNIT A — Comb. 2" dia. spot-face, chamfer 1/32" x 45° and 1-27/64" drill.
UNIT B — TAP 1-1/2"— 16.
UNIT C — Comb. 1-5/8" dia. spot-face, chamfer 1/32" x 45° and 1-13/16" drill.
UNIT D — TAP 1-1/4"— 20.
UNIT E — Comb. 1-11/32" dia. spot-face, chamfer 1/32" x 45° and 59/64" drill.
UNIT F — TAP 1"— 14.
TYPE OF MATERIAL — H. S. S.

● This prominent manufacturer of airplane engines uses Barnes Unit-Type machines for performing miscellaneous operations on various engine components. On this aluminum crankcase part the *machining time* was reduced from 35 minutes to 3 minutes. Additional savings were obtained in handling time since six spindles work simultaneously in place of one at a time. The operations performed are listed in detail in the column at the left.

WHY UNIT-TYPE MACHINE TOOLS ARE THE BEST SOLUTION FOR BOTH WARTIME AND PEACETIME PRODUCTION

Barnes Unit-Type machines are built from standard hydraulic feed and drive units. They can be mounted in any position to speed up the machining of angular surfaces on holes. Several can be used in various positions to suit the part being machined. This flexibility in design also makes it possible to rearrange the units to accommodate design changes in the part being machined. Many can be converted from war to product machining at the end of the war.

Perhaps you can save time and manpower by using these machines in your work. Whether you require equipment to fit into present production lines or need assistance in laying out a new method of processing your part, our engineers will be glad to help. Their experience in designing and building special machine tools for high production methods may help you with your war work. Call on them without obligation.

GET THESE PRODUCTION AND TOOLING IDEAS

These bulletins describe the method and procedure for getting a machine to suit the requirements of your plant and parts. Each bulletin traces a machining problem from the original study of the part to the final machine design. Each may suggest a more productive tooling set-up that you can use today — valuable file information for tomorrow. Write for bulletins 843.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

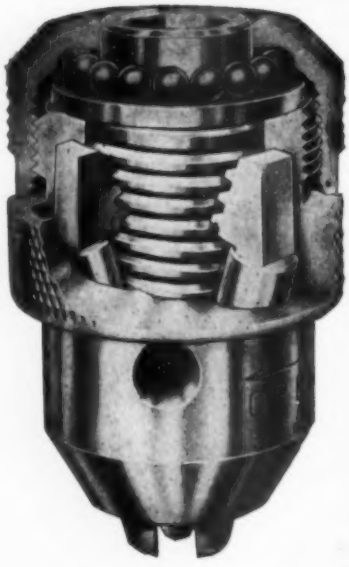
325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

IT'S JUST PLAIN COMMON SENSE

Every shop has its non-productive operations. Some can't be avoided. But every one slows up production and adds to costs. So it's common sense, and good business as well, to eliminate every non-productive move you can.

A non-productive operation in the drilling department is the tightening and retightening of drill chucks with keys. A check-up of the amount of time used up in this operation would probably surprise you. It is a needless waste of time because it can be completely eliminated by equipping your drill presses with

Ettco-Emrick KEYLESS DRILL CHUCKS



MADE IN 5 SIZES for No. 0 to ⅝" drills. Available also for portable drills.

These chucks are self-tightening. All the operator has to do is insert the drill and turn the knurled body by hand just enough to hold it. Drilling action does the tightening — and the heavier the load the tighter the hold — so retightening is never necessary. They're the ideal chucks for girl operators because no strength is required.

BULLETIN No. 6 gives you full details about Ettco-Emrick Keyless Drill Chucks, including the high quality and precision construction that assures you of long, hard, trouble-free service. A copy will be mailed to you on request. Write for it today.

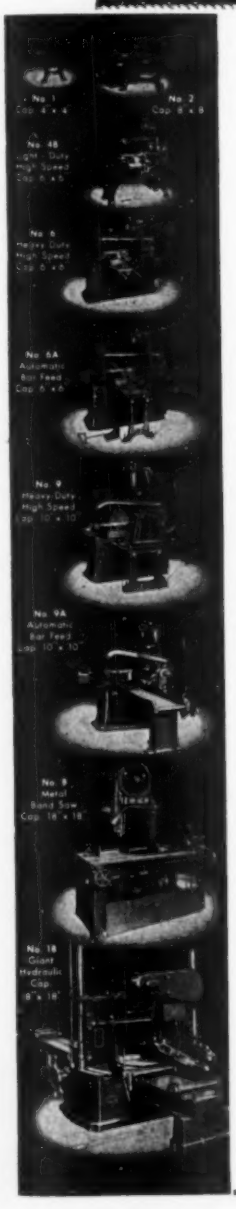
ETTCO TOOL CO.

586 Johnson Ave., Brooklyn 6, N. Y.

DETROIT CHICAGO

The Famous Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

MARVEL SAWS



Accurate, Fast, Dependable and each cutting at a different angle

One of the universal features of MARVEL No. 8 Metal-cutting Band Saws is well illustrated in the above picture taken at the Gorham Tool Company, Detroit. Here a battery of 4 MARVEL No. 8's, attended by a single operator, are all busily cutting-off tool bits from nested high speed steel shapes, ***and each is cutting at a different angle.*** These MARVEL No. 8's are also used by this firm for cutting-off blanks for side and end mills, and for cutting out crankshaft tools, form tools and dovetails. Handling work to 18" x 18" cross section, almost any type cut, these universal tools have proven "very economical on splitting operations, accurate, fast and dependable."

Buy from your local distributor

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave.
Chicago, U. S. A.

Eastern Sales Office:
225 Lafayette St., New York

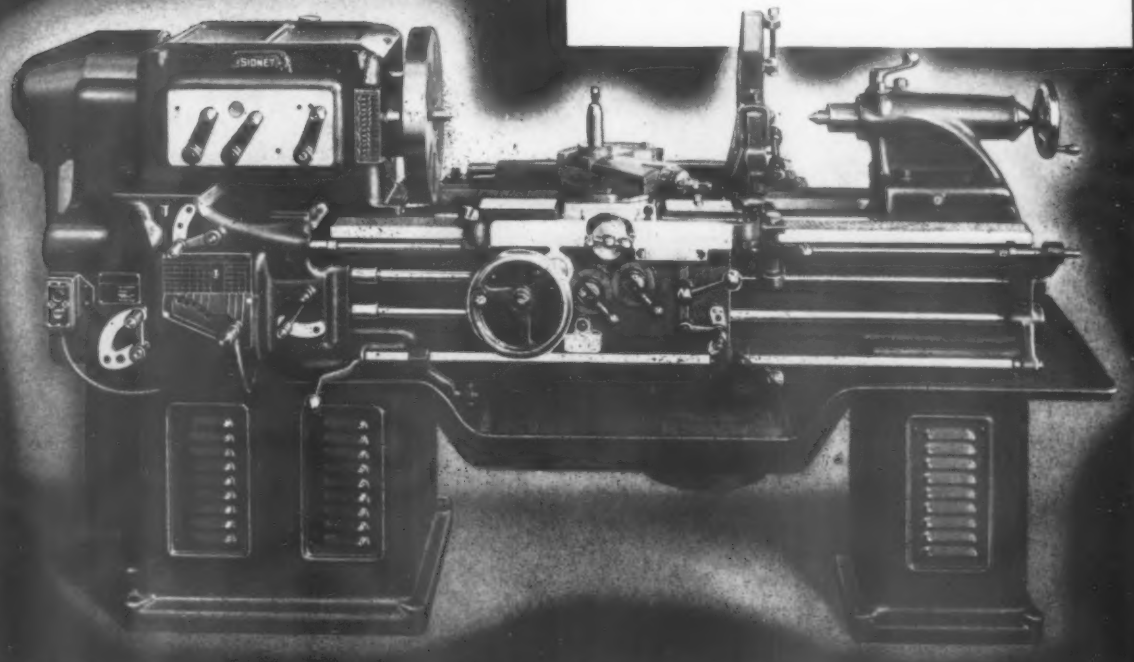
SIDNEY
Precision Built
LATHES
12 Speed Model

SIDNEY
THE SIDNEY MACHINE TOOL CO. SIDNEY-OHIO-U.S.A.

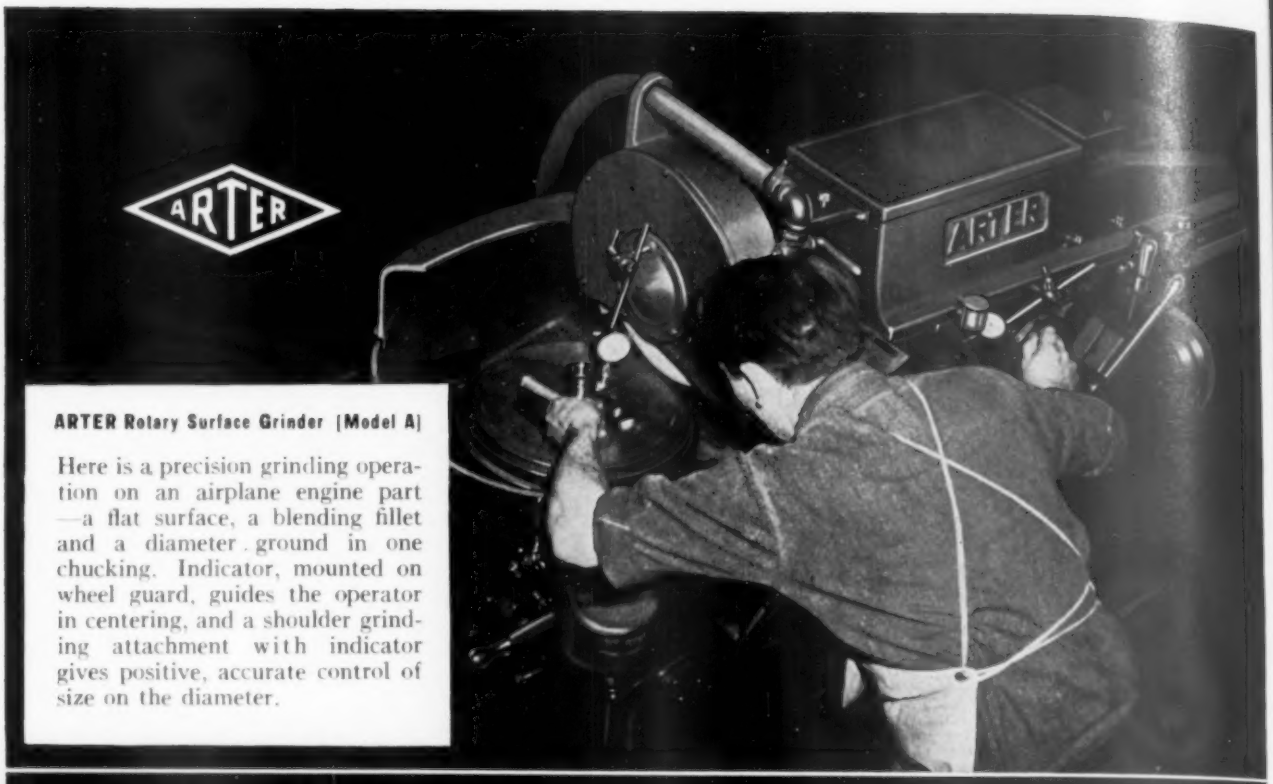
● These sturdy, precision built lathes have twelve selective spindle speed changes without the use of jaw clutches. These changes are obtained through accurately cut spur gears of chrome molybdenum alloy steel, heat treated, hardened, shaved and cross-axis machine lapped. The sliding gears have rounded teeth, and staggered to permit of easy engagement. The gears slide on ground multiple splined shafts with integral keys. All shafts turn on anti-friction bearings. The Spindle is mounted on precision tapered roller bearings.

These are a few of the many precision points in construction that result in more accurate work—greater production—easier handling.

The 12 speed model is currently available in a size range from 14″ to 20″ inclusive.



The SIDNEY MACHINE TOOL Company
Builders of Precision Machinery
SIDNEY ESTABLISHED 1904 OHIO



ARTER Rotary Surface Grinder (Model A)

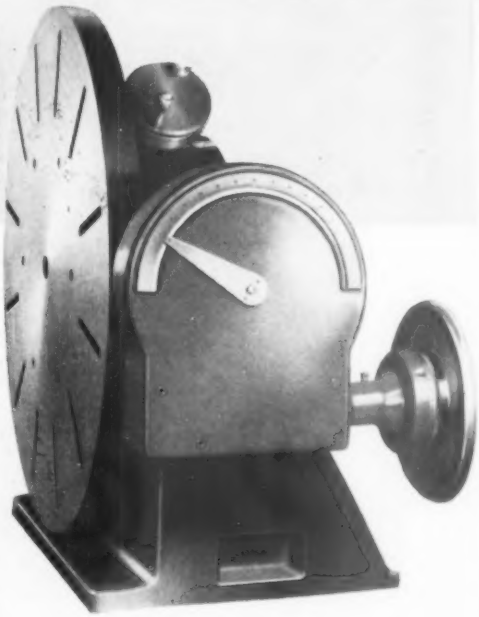
Here is a precision grinding operation on an airplane engine part—a flat surface, a blending fillet and a diameter ground in one chucking. Indicator, mounted on wheel guard, guides the operator in centering, and a shoulder grinding attachment with indicator gives positive, accurate control of size on the diameter.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

Announcing **ROTAB**

A device which makes for speed, simplicity, and accuracy in checking or machining all angles of large cumbersome castings.



Once the work is fastened onto the 36-inch table, it can be entirely checked for all its angles without disturbing the original clamping. The table can be rotated to any degree, and can also be set at any angle from the vertical to the horizontal, and even 30 degrees below in the opposite direction. Graduated dials register degrees and minutes, with a 10-inch sine bar provided for closer settings. All can be locked in fixed position.

Because of its ability to assume a wide range of angles, the ROTAB presents an additional distinction. It can be utilized also as a holding fixture for boring mill setups.

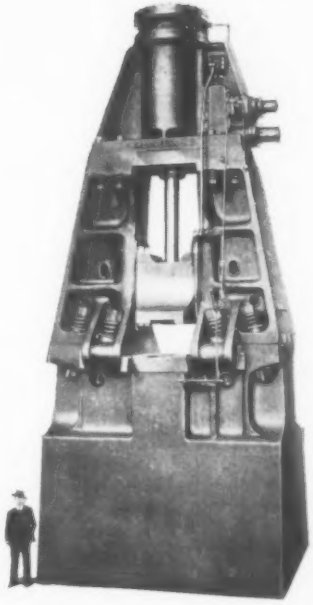
BUY WAR BONDS

Send for illustrated folder giving complete information with dimensions.

MACHINE PRODUCTS CORPORATION • 6775 EAST McNICHOLS ROAD, DETROIT 12, MICH.

Victory is being HAMMERED out!

In the thousands of forge shops of the United States and her allies, the Hammers of War are beating out the forgings that will finally become integral parts of the overwhelming might of the Allied forces. Rifles, anti-aircraft and machine guns, all types of artillery, in fact all weapons are either wholly or largely forgings. Engine parts, transmissions, axles, tank treads, pins and other critical parts in combat vehicles, as in the modern truck and automobile, are forgings. Battleships, cruisers, destroyers, submarines are studded with forgings. And the combat plane, from propeller hub to tail controls is a mass of fine forgings.



This is the lesson the War has taught us—a lesson that must carry over into the trying days of the Peace that will follow V-Day—the lesson that there can be no substitute for the strength, light weight and toughness of the drop forging and its ability to withstand "unpredictable" stresses, strains and shocks.

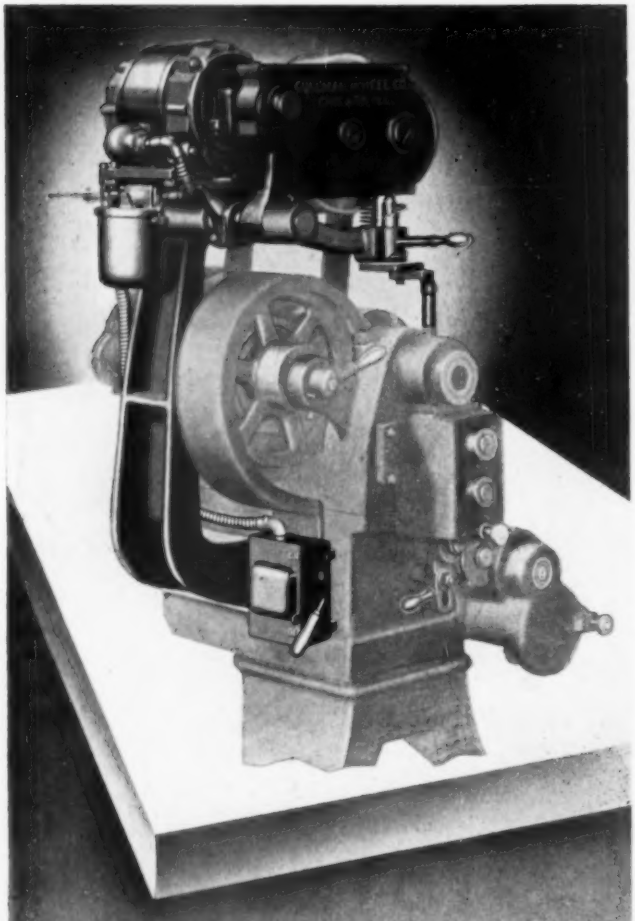
Victory is truly being HAMMERED out—and in a great measure on Chambersburg Hammers.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

ARMY E NAVY

CHAMBERSBURG

HAMMERS · CECOSTAMPS · PRESSES



Get 25% More Output

from the Machines You Have with CULLMAN DRIVES

Cullman Drives will modernize shaft and belt driven lathes, screw machines, shapers, and similar equipment to give an increased output of more than 25%.

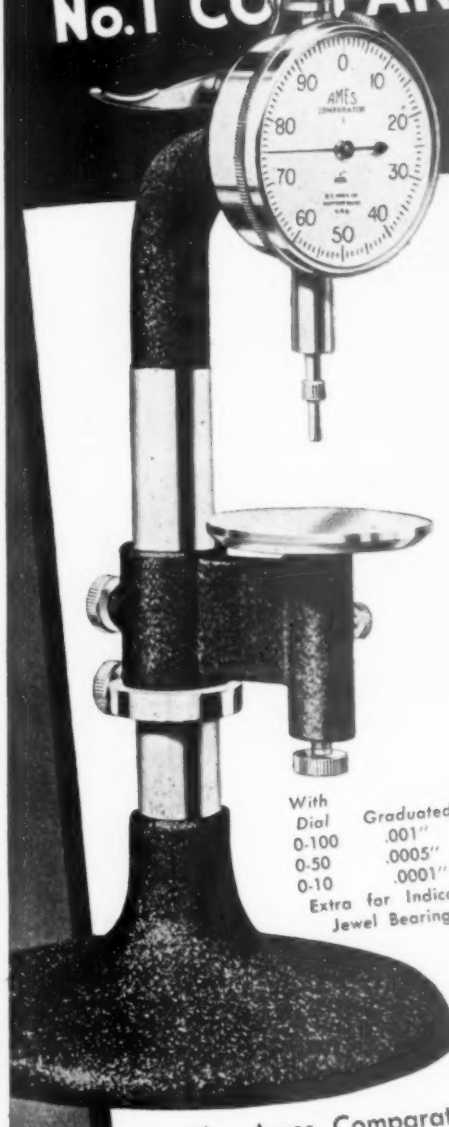
Cullman Drives give individual machine control, have greater flexibility, and are safer in operation than overhead line shaft drives. They permit the utmost in efficient arrangement for work flow and lighting.

Cullman Drives are sturdy and built for long life. They operate with belt-drive smoothness. They are easy to install and economical to buy. They are built for motors from ¼ to 15 H. P. Prompt delivery can be made on most sizes.

Write for full information on Cullman Drives and the 60 day trial plan.

CULLMAN WHEEL COMPANY
1352-R ALTGELD STREET CHICAGO, ILLINOIS

AMES No. 1 COMPARATOR



With Dial	Graduated	Price
0-100	.001"	$30.00
0-50	.0005"	30.00
0-10	.0001"	45.00

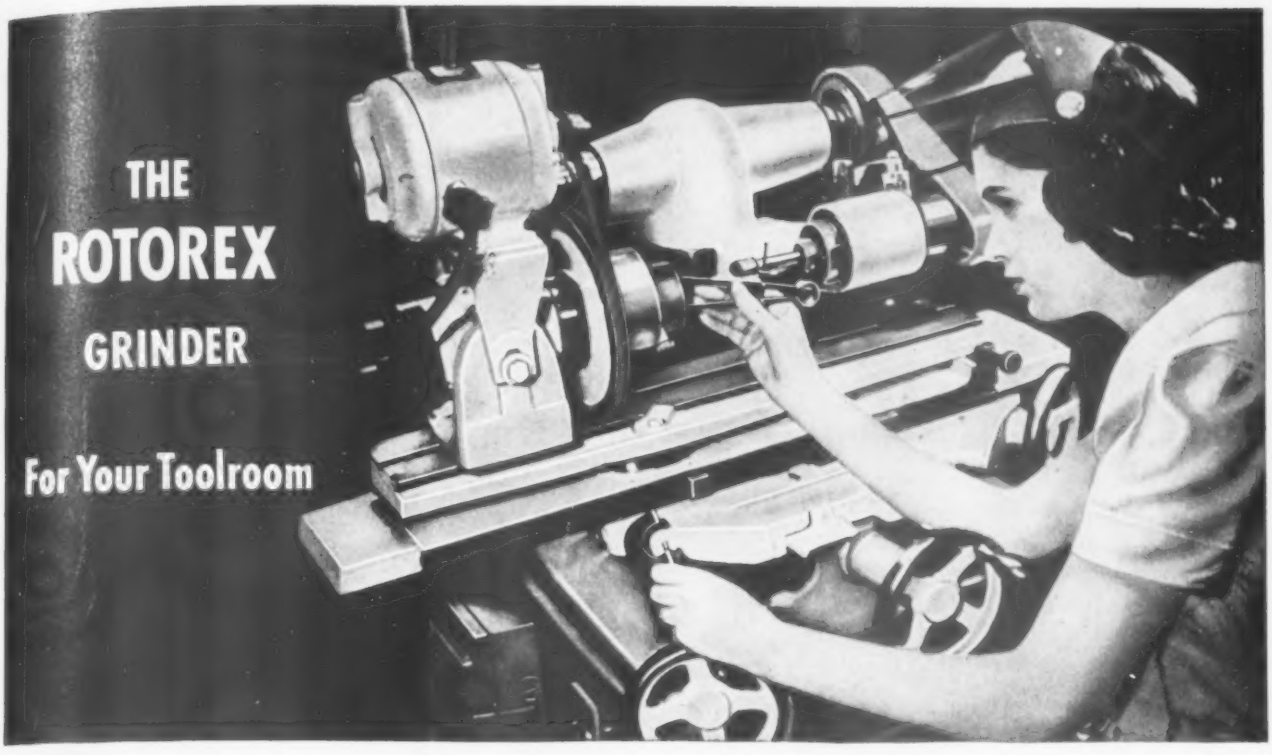
Extra for Indicators with Jewel Bearings $3.00

The Ames Comparator No. 1 stands 9½" high, has a table that is adjustable for height and will measure objects up to 2" in cross section. The indicator is 2¼" in diameter and offered in a variety of dial graduation numberings and values. The lever at left is pressed down to lift the indicator spindle, while releasing it permits the spindle to return quickly.

Other models are shown in catalog No. 54.

Send for a copy.

B. C. AMES CO., WALTHAM, MASS.



Means MORE SATISFACTORY PERFORMANCE FOR YOU

Thousands of Rotorex Grinders are in service all over the world performing operations with speed and precision on vital war material.

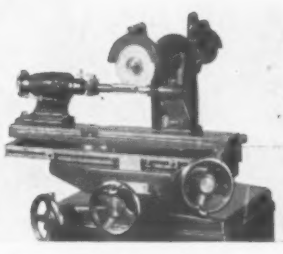
On a production line, as well as in tool maintenance a wide range of work can be done on the Rotorex such as: cylindrical and internal grinding as well as sharpening of all kinds of tools to the closest of tolerances.

Easy interchangeable attachments for faster set-ups, selective speed range from 3000 to 6000 rpm are outstanding features.

Simplicity of design and operation makes it possible for even unskilled workers to operate with the highest efficiency.

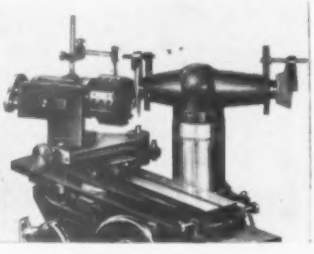
Write today for the new 100 page grinding handbook No.503 for the Douglas-Rotorex Universal Tool and Cutter Grinder.

INCREASED FACILITIES enable us to make PROMPT SHIPMENTS



Tap Grinding Attachment

Sharpening Helical Cutter



Radius Grinding Attachment

DOUGLAS MACHINERY CO., Inc.
158 BROADWAY · NEW YORK, N. Y.

4359

See
HOW YOU CAN CUT TOOL COSTS!

Longer Service from Taps and Reamers

Many a tap or reamer is scrapped long before it is worn out because it is blamed for poor performance —often not the fault of the tool itself.

You'll be surprised how often the real trouble can be traced directly to spindle misalignment. This, however, can be easily corrected by simply using a Ziegler Floating Tool Holder which is so designed that it automatically compensates for such misalignment. Get one and see for yourself.

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Made To Fit Any Machine

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

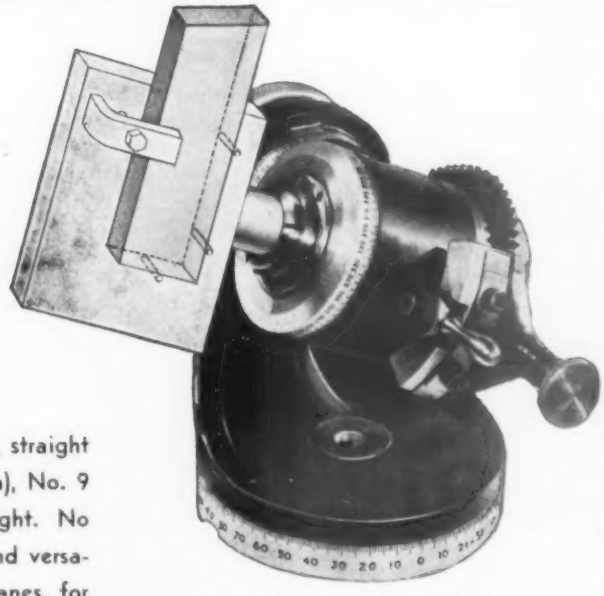
W. M. Ziegler Tool Co.
1920 Twelfth St.
Detroit, Mich.

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

You'll find
101 USES
for this
UNIVERSAL PRECISION
INDEXING HEAD

All of your regular tools will fit the standard No. 4 Morse, straight shank Hardinge collets or, with a conversion sleeve (extra), No. 9 B. & S. without the use of special set-up as shown at right. No other piece of equipment in your shop is so adaptable and versatile . . . nor more accurate. Graduated 360° in three planes, for every simple or compound angle. Can be used on any tool or surface grinder. Prompt delivery.

Write for illustrated circular.



TO ACCURATELY GRIND IRREGULAR PIECES

Square or odd-shaped pieces may easily be held as shown in the illustration. Simply weld a plate to round shank, insert guide pins and clamp firmly.

CLEVELAND TOOL ENGINEERING CO.

9113 DETROIT AVE. • CLEVELAND, OHIO

Names THAT INSURE *Precision* IN THE AVIATION MOTOR INDUSTRY

These big names didn't just happen . . . they "earned" their position . . . they stand for all that is best in engineering skill and precision production . . . names that have made American aircraft motors mighty, and supreme.

In the name WESSON, such leaders have recognized the leader in the production of Carbide Cutting Tools . . . a name that also means the "know how" . . . and the "will to do."

WESSON helped tool up for production of the aviation motors that are now writing history in all parts of the world . . . for Victory.

To industries desiring to machine the modern, tougher metals, faster, to closer tolerances, finer finishes . . . speeding production, conserving precious metals, improving products . . . WESSON engineers are available for counsel on present problems and on post-war planning.

WESSON CO. DETROIT, MICH. (Ferndale Station)

REPUTATIONS GO ON . . . In the busy post-war era of the future, the new precision standards established in war production will be adopted to peacetime products . . . making new and better products . . . at lower production costs . . . for longer service. WESSON Carbide Cutting Tools will go on into the "new action" in industry and help advance "the more abundant life." To this end WESSON is devoting broad research and cooperation with forward-looking metal-working manufacturers.

FOUND *A New Way to Lower* WHEEL DRESSING COSTS!

TRU-THREAD DIAMOND DRESSING TOOL . . . STEPS UP THREAD GRINDING PRODUCTION

Examine this new TRU-THREAD diamond dressing tool by Wheel Trueing Tool Company, Inc. You'll see the latest development of an organization that has spent 33 years designing, developing and building diamond tools of fine quality.

You'll see a diamond dressing tool that is setting new records of speed and economy—one that can boast production increases as high as 500% and reductions in per piece grinding costs 75%.

How is this possible? Wheel Trueing engineers have found a way of utilizing the hard characteristics of the natural uncut diamond—never before thought possible in tools of this type. The result is a tool that cuts cleaner—obtains forms faster. Forms hold longer. Fewer dressings are required. More work can be ground between dressings. Down time is reduced. And this tool can be made and re-serviced on a production basis, assuring quick deliveries.

DIAMOND TOOLS for

Straight, form, thread and radius dressing, turning, boring, gaging, and core drilling

You'll learn many other advantages of TRU-THREAD TOOLS once you put them to work on your thread grinding machines. *Write or wire for further information today!*

WHEEL TRUEING TOOL COMPANY INCORPORATED

3200 W. DAVISON DETROIT 6, MICH.

MAINTENANCE OF HYDRAULIC SYSTEMS

FUNCTIONS OF HYDRAULIC OILS

INTERPRETING HYDRAULIC OIL SPECIFICATIONS

OIL CHARACTERISTICS AFFECTING PERFORMANCE

TROUBLE SHOOTER'S CHART

MANUFACTURER'S RECOMMENDATIONS

Every Page

OF THIS FREE MAINTENANCE MANUAL IS FILLED WITH MONEY SAVING FACTS . . .

The headlines above are titles of some of the articles appearing in Warren's new brochure on hydraulic oils. More than seventy pages of basic information have been compiled to provide positive assistance in eliminating operating problems in hydraulic systems.

Learn how WARCO SUPER HYDROILS or WARCO E. P. HYDROILS can increase production in your plant through a controlled, preventive-maintenance plan.

Investigate WARCO HYDRAULIC FLUSHING OIL and WARCO HYDROIL CONCENTRATE — the products which will save time and money in cleaning contaminated systems. They completely remove gummy deposits and sludge in a few hours without dismantling pumps or valves.

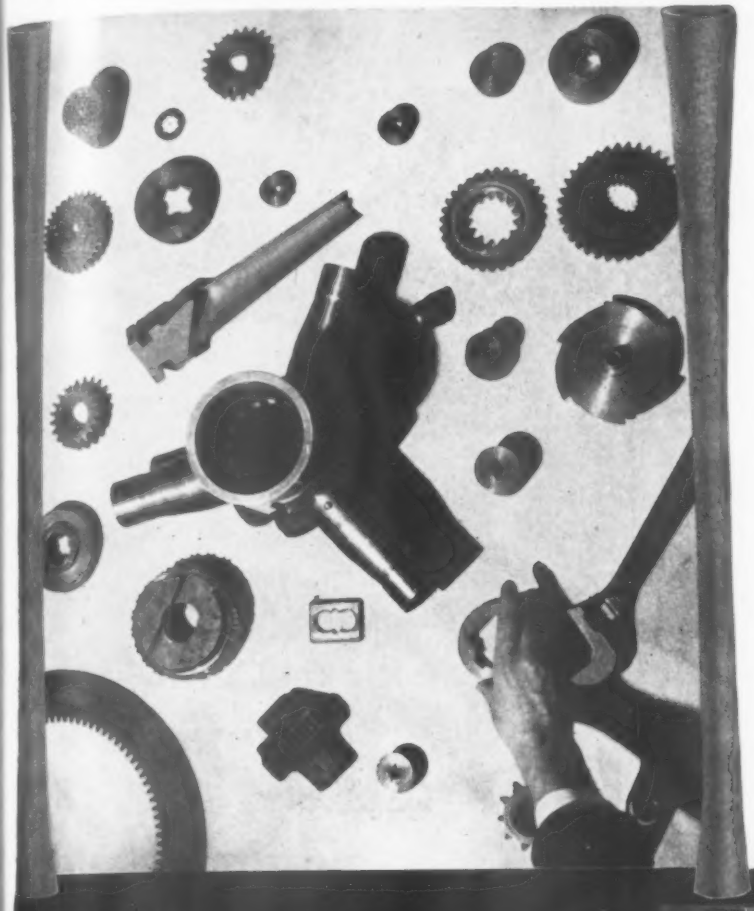
Maintain peak performance in your hydraulic equipment by writing for your copy today! It's free.

Specialized PRODUCTS

THE WARREN REFINING AND CHEMICAL CO.

CLEVELAND 5, OHIO

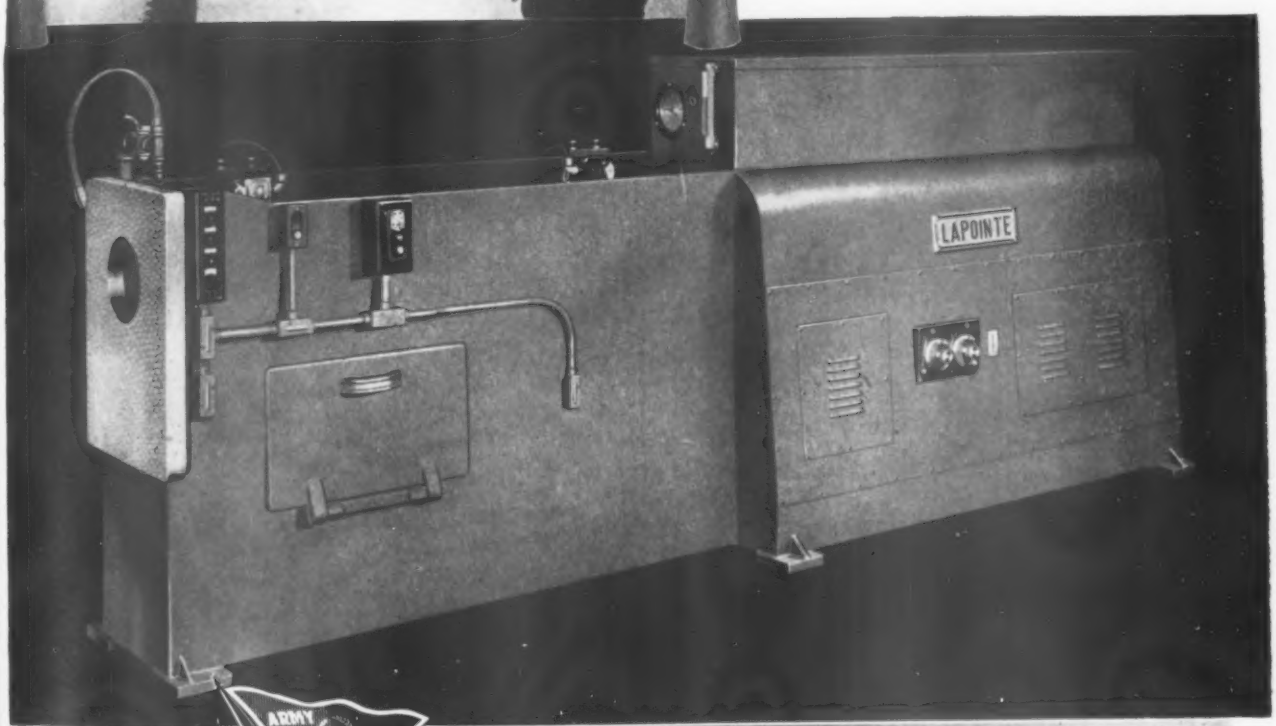
Primary Production Precision



for the BLUE PRINTS of TODAY and TOMORROW

Putting into the blueprints of the future the products of today and tomorrow is the outstanding contribution of broaching today. For whether these products be aircraft, armament or adding machines, broaching will produce more, more accurately . . . and far less expensively. Investigate Primary Production Precision—broaching today.

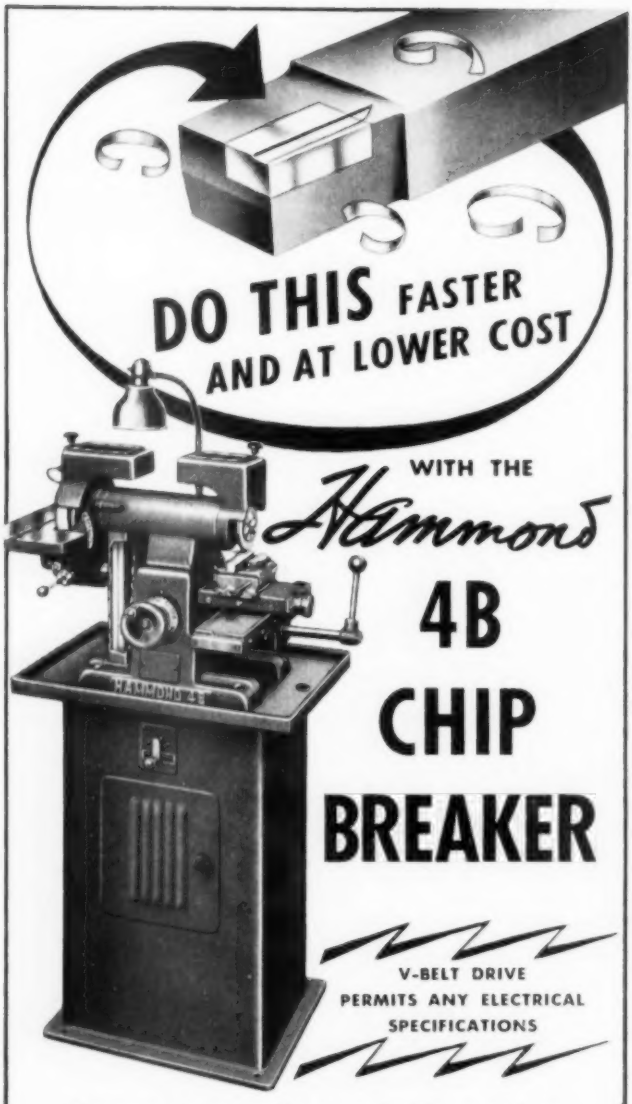
Lapointe Horizontal Broaching machine (HP-100) with complete automatic controls, rapid return speed and modern, engineered construction.



ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.



DO THIS FASTER AND AT LOWER COST

WITH THE Hammond 4B CHIP BREAKER

V-BELT DRIVE PERMITS ANY ELECTRICAL SPECIFICATIONS

Do you tie up millers or surface grinders for carbide tool grinding jobs? Don't do it! Investigate the new Hammond 4-B — built specifically to grind chip breaker grooves easier, faster, better. Write for Bulletin 201 which shows how to get *complete* and *proper* carbide tool maintenance.

BULLETINS AVAILABLE ON HAMMOND PRODUCTS—CHECK AND RETURN

- ☐ Chip Breaker Grinders
- ☐ Carbide Tool Grinders
- ☐ General Purpose Grinder
- ☐ Heavy Duty Grinders
- ☐ Abrasive Belt Grinders
- ☐ Rotary Automatics
- ☐ Cylindrical Polishers
- ☐ Polishing Lathes

Hammond Machinery Builders INC.

KALAMAZOO 54F, MICHIGAN

1636 DOUGLAS AVENUE

Eastern Branch — 71 West 23rd Street, New York 10, N. Y.

Eclipse RADIAL DRIVE Keeps Pace With the VICTORY DRIVE

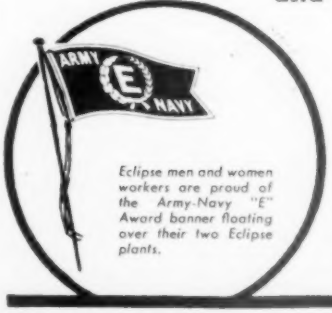
"Every 4 Minutes and 40 Seconds A Warplane Will Leave the Assembly Line in 1944" ★ ★ ★

Eclipse Cutting Tools Are Helping Today To Make This Great Production Possible!

More and more Eclipse Radial Drive Cutting Tools are leaving our two complete manufacturing plants every day to help 'eclipse' the Axis in '44! Tanks, too, and jeeps, trucks, PT's, bombs, shells, anti-aircraft guns are better produced because of the use of the following Eclipse precision built Cutting Tools:

Radial and Pin Drive High-Speed and Tungsten-Carbide—

COUNTERBORES
COUNTERSINKS
BACK-SPOTFACERS
TWO-PIECE CORE DRILLS
INSERTED BLADE CUTTERS
WELCH PLUG CUTTERS
MULTI-DIAMETER CUTTERS
SPECIAL DESIGN TOOLS



Eclipse men and women workers are proud of the Army-Navy "E" Award banner floating over their two Eclipse plants.

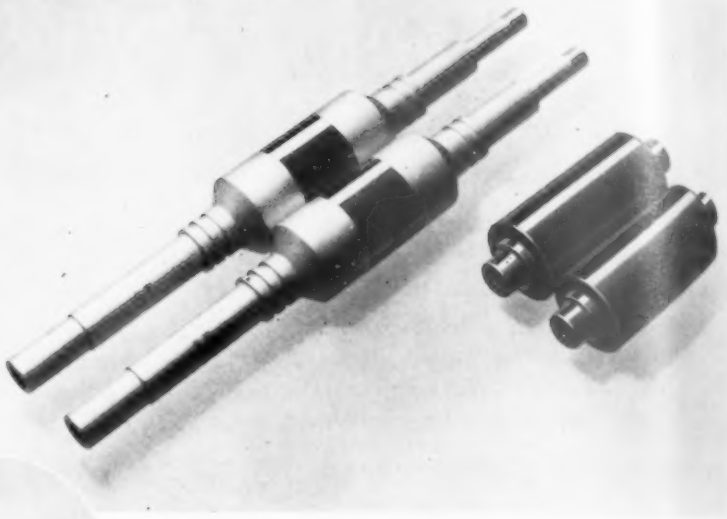
ECLIPSE COUNTERBORE COMPANY

DETROIT 11, MICHIGAN

A BARNES BLADE IS Better

Barnes hack saw blades and band saws are made in a modern plant devoted exclusively to blade production. Finest materials and expert craftsmanship make Barnes blades the first choice for every metal cutting job. Order from your mill supplies distributor.

TYPICAL OF LINCOLN PARK'S *Extreme* PRECISION IN CEMENTED CARBIDE WORK



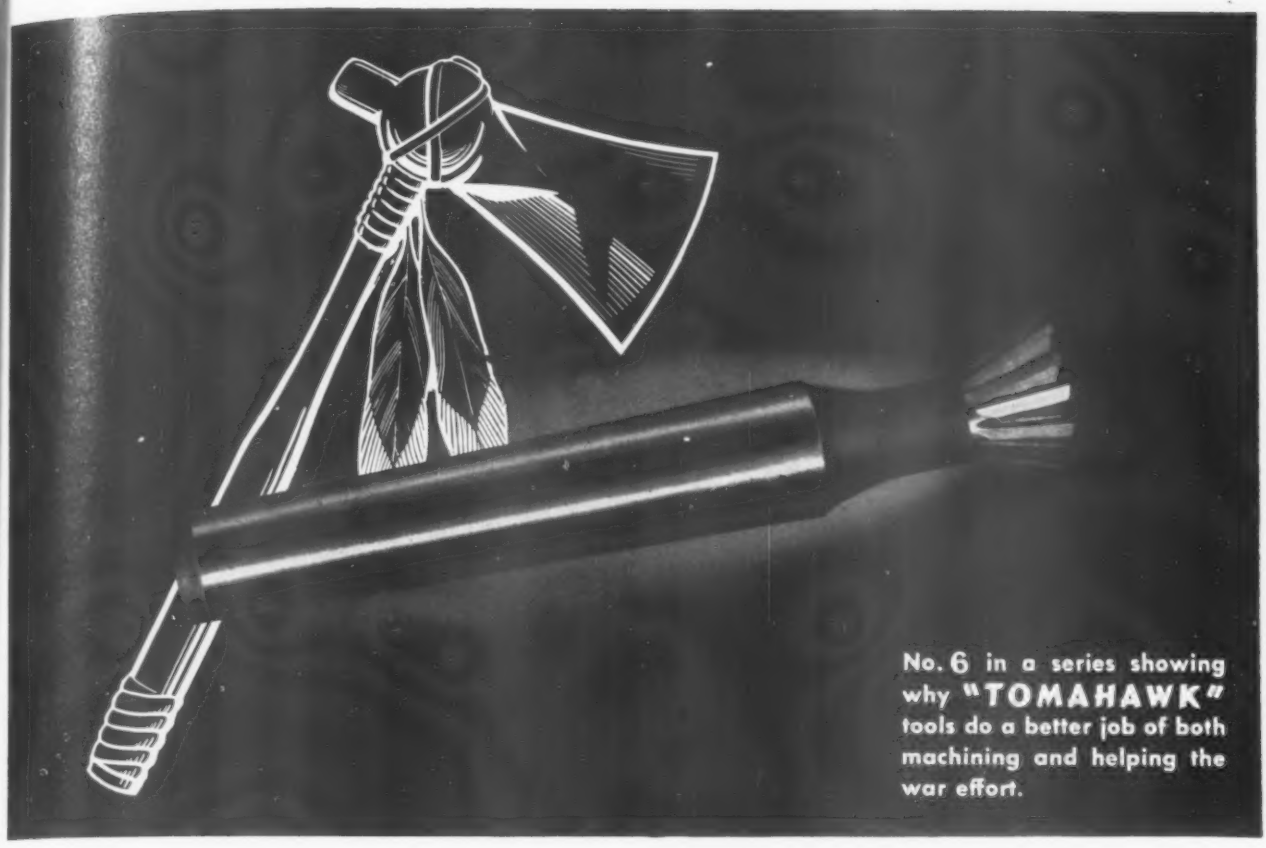
At the upper right are shown two sets of rolling mill rolls, typical of many jobs of this nature produced at Lincoln Park. Both of these sets were held to within a few millionths of an inch in rotundity. Their finish is measured as a fraction of a microinch. Because of the wear-resistance of these precision rolls, frequent replacements with reconditioned rolls, and resulting machine "down-time", have been eliminated. After three years of constant use, rolls similar to these are still in service.

The lower illustration shows a burnishing wheel, a burnishing nest, and work holding centers—all of solid cemented-carbide. The wheel burnishes on either the periphery or face. It must be held to extremely close tolerances to produce precise pivots and bearing surfaces. Runout is practically zero.

The burnishing nests, used for supporting parts during the burnishing operation, have an extremely smooth lapped finish. The centers have a lapped female center in the tip. On these centers, concentricity with the body is highly important.

In cemented-carbide gage manufacture, and in the production of special tools such as these, Lincoln Park has had wide experience in working to extremely high degrees of accuracy and finish. Let us show how this experience can be put to excellent use in meeting even your most unusual requirements.

LINCOLN PARK TOOL and GAGE CO.
LINCOLN PARK, MICHIGAN



Trade "TOMAHAWKS" had wooden handles

Now many **"TOMAHAWKS"** like this end mill from Genesee have 'handles' of machine steel, butt-welded to the high speed steel cutting end.

In addition to conserving precious H.S.S., and simplifying production, the soft steel 'handle' improves the tool, since it provides hardness where hardness is needed (at the working end) and toughness and resilience where those are essential (in the shank).

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

GENESEE TOOL COMPANY

FENTON, MICHIGAN

ALCO
EFFICIENT TOOLS

For the Aviation Industry

ALCO ACORN DIE HOLDER ALCO BUTTON DIE HOLDER

Hundreds of small parts made on automatics and dozens of larger units on hand screw machines and turret lathes are profitable production items for contractors and sub-contractors serving the airplane industry. Aviation is playing the major role in softening up the enemy today, and will be an important factor in expanding world commerce in the days of peace to come.

Standardize now on ALCO Die Holders, either Button or Acorn Type, for guaranteed accuracy of all outside threading operations. The floating operation of the flanges on both types results in absolute concentricity when setting up, and maintains perfect threading on exact centers throughout the run. Quick and easy set-up for high speed production.

ORDER TODAY
WRITE FOR CATALOG

ALCO TOOLS

THE ALCO TOOL CO.

453 Birdseye St., Bridgeport, Conn. • Detroit Office: 908 Stephenson Bldg.

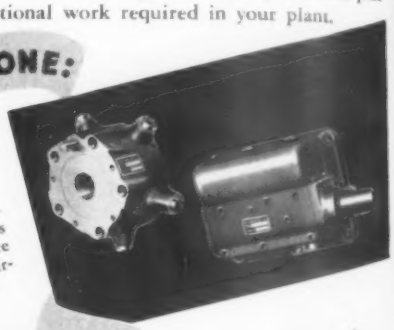
GET THE *Right* HYDRAULIC CIRCUIT FOR NEW DESIGNS OR CHANGEOVERS

. . . by using
UNIT-TYPE TRANSMISSIONS DESIGNED TO SUIT YOUR NEEDS

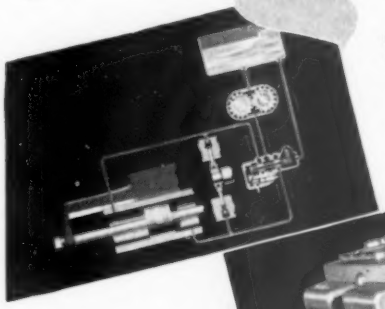
Getting the right hydraulic circuit for your new machine or other industrial equipment designs is simple. Barnes' Hydraulic Engineers will be glad to work with you and make recommendations for obtaining a trouble-free hydraulic unit, for either new designs or present equipment. All elements needed to make your equipment perform smoothly will be contained in a unit designed to blend in with the design of your equipment.

The unit will be shipped to you ready to install. Connecting two pipes to each cylinder and mounting the unit in position is practically the only additional work required in your plant.

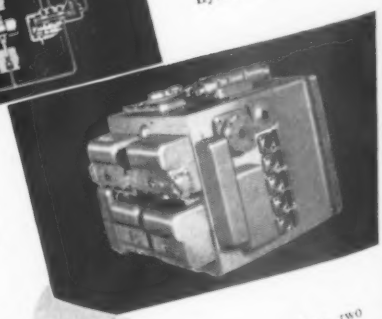
HOW IT'S DONE:



Barnes pre-tested and perfected elements such as pumps and valves are used in the proper circuit to suit your job.



Complete circuits are designed from standard elements, pumps, valves, etc., making one supplier responsible for the successful operation of your hydraulics.



The circuit is housed as a self-contained unit or panel and shipped to you for assembly.

Merely connecting two pipes to each hydraulic cylinder and mounting the unit or panel completes the hydraulic installation.

FREE DATA

40-page booklet contains detail descriptions of all Barnes elements and typical installation circuits. Write for your copy today. Ask for bulletin T.E. 843.

John S. Barnes Corporation

DETROIT SALES OFFICE
503 NEW CENTER BLDG.
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MAIN OFFICE AND FACTORY
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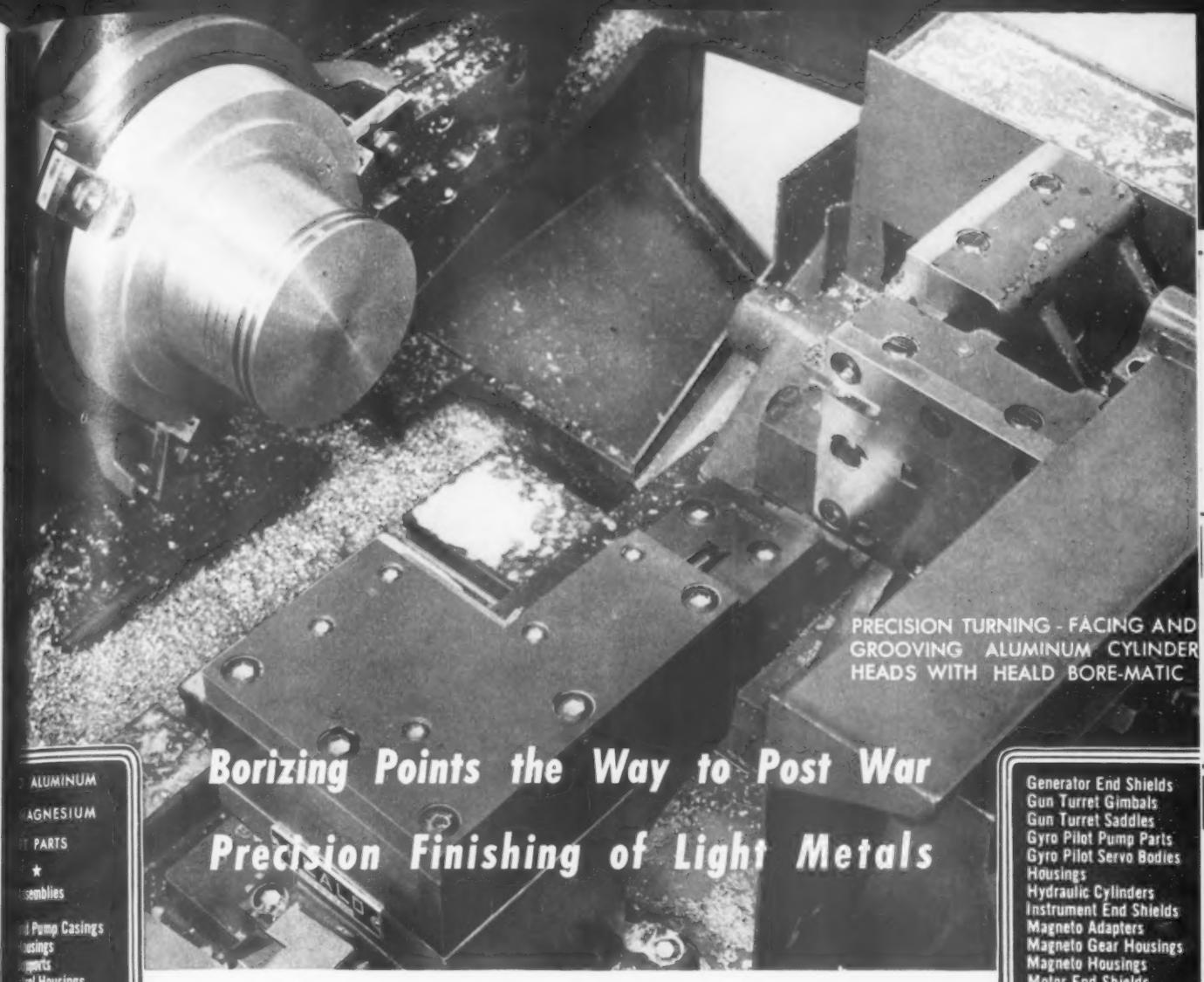

PRECISION TURNING - FACING AND GROOVING ALUMINUM CYLINDER HEADS WITH HEALD BORE-MATIC

Borizing Points the Way to Post War Precision Finishing of Light Metals

What can be accomplished with light metals such as aluminum and magnesium, and indicative of what will be done with these alloys in post-war manufacturing, has already been shown by the aircraft industry. Approximately 40 per cent of the aircraft engine is comprised of light metals, and largely because of this it has been possible to reduce the horsepower-weight ratio to 1 lb. per horsepower.

Just as valuable as the aircraft industry's lesson to the post-war world on the use of light metals are the lessons to be learned from their methods and practices in machining aluminum and magnesium. Their methods of finishing parts made of these metals deserves particular attention. Study of their processes reveals the outstanding fact that *borizing*, or precision boring, turning facing, and grooving with cemented carbide or diamond tools, is used almost exclusively for precision finishing of aluminum and magnesium. The partial list of aircraft parts given herewith is eloquent testimony of this—all of them are made of either aluminum or magnesium and all of them are *borized*.

ALUMINUM
AGNESIUM
PARTS
★
emblies
Pump Casings
usings
ports
rol Housings
Brackets
Housings
Bodies
Main Bodies
ctor Housings
eads
Muffs
Assemblies
Sections
Blower Sections
Front Sections
Center Sections
Covers
Rear Covers
te Crankcases
te Rear Crankcases
Crankcases
kcases
Bearing Caps
Oil Plugs
Oil Plugs
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Bodies
Drive Shafts
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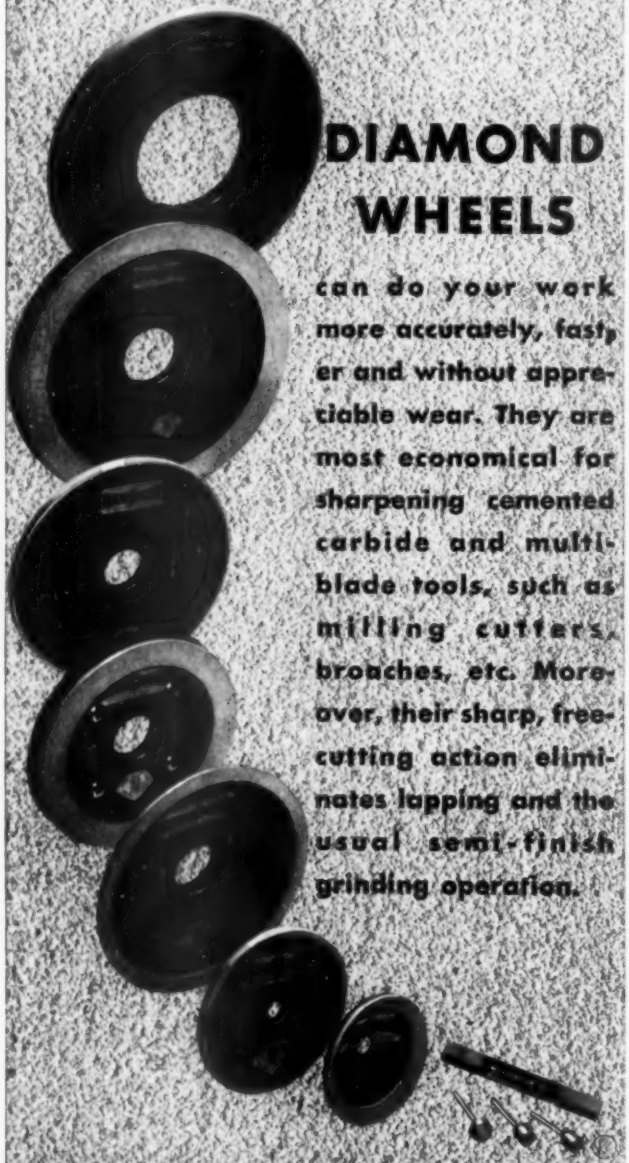
Generator End Shields
Gun Turret Gimbals
Gun Turret Saddles
Gyro Pilot Pump Parts
Gyro Pilot Servo Bodies
Housings
Hydraulic Cylinders
Instrument End Shields
Magneto Adapters
Magneto Gear Housings
Magneto Housings
Motor End Shields
Oil Pumps
Oil Pump Bodies
Oil Pump Covers
Oil Pump Scavenger Casing
Pistons
Plates
Pump Housings
Propeller Domes
Propeller Shaft Bearings
Propeller Shaft Plugs
Rear Cam Supports
Rear Reduction Gear Cases
Reduction Drive Supports
Reduction Gear Cases
Regulator Covers
Regulator Housings
Selsyn Motor Parts
Shock Absorber Fittings
Speed Reducer Housings
Supercharger Bearing Caps
Supercharger Front Casing
Supercharger Gear Casings
Supercharger Rear Casings
Supercharger Rear Covers
Valve Brackets
Valve Housings
Valve Guides
Valve Tappet Guides
Volute Casings
Water Pump Casings
Wheelcases

For More Precision, FASTER

bring your problems to

The HEALD MACHINE CO., Worcester, Mass.

SECOMET



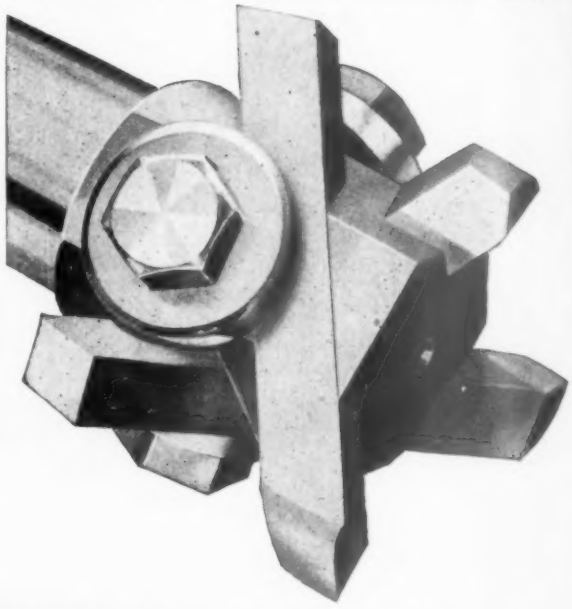
DIAMOND WHEELS

can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-blade tools, such as milling cutters, brouches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation.

J. K. SMIT & SONS

157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

a totally different kind of surface facer



IMPOSSIBLE? *You bet not!* **Every claim made for this tool** *can be proved!*

1 Replaces End, Shell, Slab Mills, and Inserted Tooth Cutters;

2 Fits all vertical and horizontal milling machines, drill presses and other spindle machines;

3 Quickly and accurately adjustable, just four tool sizes cover all fractional diameters from 1¼" to 5";

4 Slashes tool costs up to 75%;

5 Clark tool blades are not ruined by hard spots in castings, re-extruded Dural, etc.—bits may be quickly touched up and sharpened free hand;

6 Tool blade life is unusually long, replacement cost low;

7 Cuts any material under the most severe operating conditions accurately, swiftly, economically;

8 Ample blade clearance avoids chip clogging and resultant slow-downs;

9 Tools available with all types of blades, including carbide tips;

10 Prompt delivery on suitable priority.

CALL YOUR JOBBER TODAY

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CLARK ADJUSTABLE

FACING TOOL

GET THE FACTS about Clark Adjustable Hole & Fly Cutters —they, too, are remarkable new-type tools!

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Robert H. Clark Company

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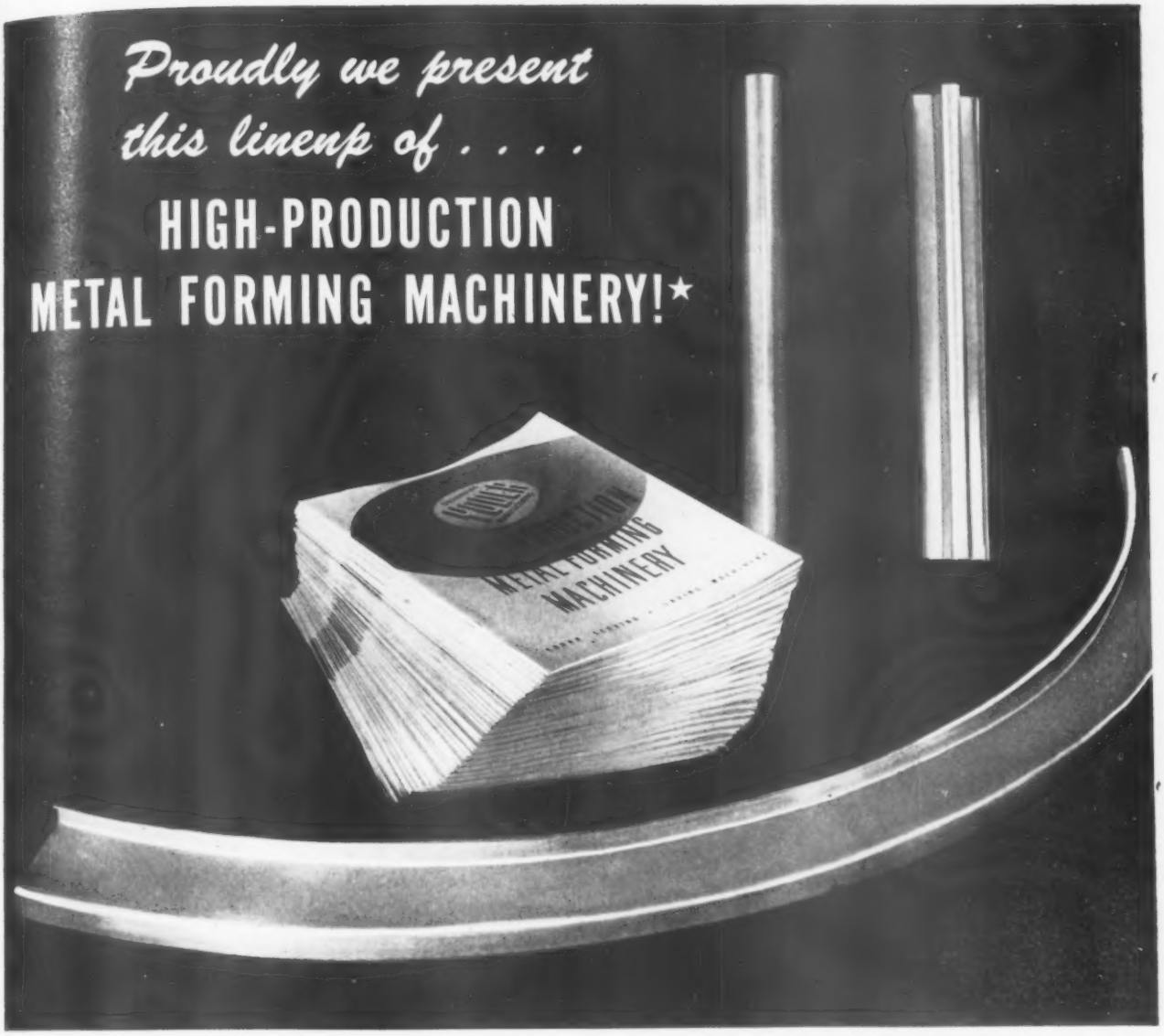
MANUFACTURERS: PRECISION TOOLS, PRECISION PARTS



★ To the fabricator wanting the machines that embody the largest number of the latest in improvements in this type of equipment, we say, "You will do well to choose a 'Yoder'."

When we tell you that, "You get the improvements first from Yoder," we point with pride to our record of thirty years and more of pioneering effort.

The war emergency has placed tremendous emphasis upon high-production machinery. Yoder Equipment gives you an "up-to-dateness" that helps you to face today's and tomorrow's problems with complete confidence.

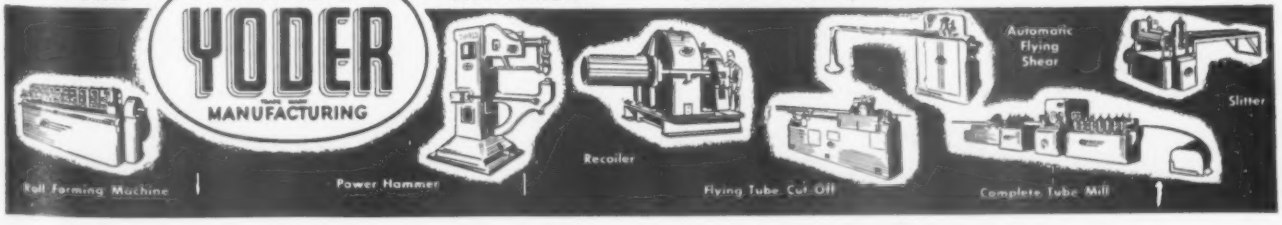
This "Yoder High-Production Metal Forming Machinery" BULLETIN is not meant to answer all of your questions—just to give to you a general idea of the things we have been designing and manufacturing. When it is roll-forming, cutting-off, edge conditioning, uncoiling, slitting, coiling, bending, leveling, and tube making, send us your sketches and a few details. We'll respond with a "proposal" including prices and recommendations. However, if your interest has not progressed to that stage, just send for the BULLETIN and we'll be glad to mail it to you immediately.

METAL • FORMING • PRODUCTION • MACHINERY

ENGINEERING **YODER** MANUFACTURING

THE YODER COMPANY

CLEVELAND, OHIO • U.S.A.

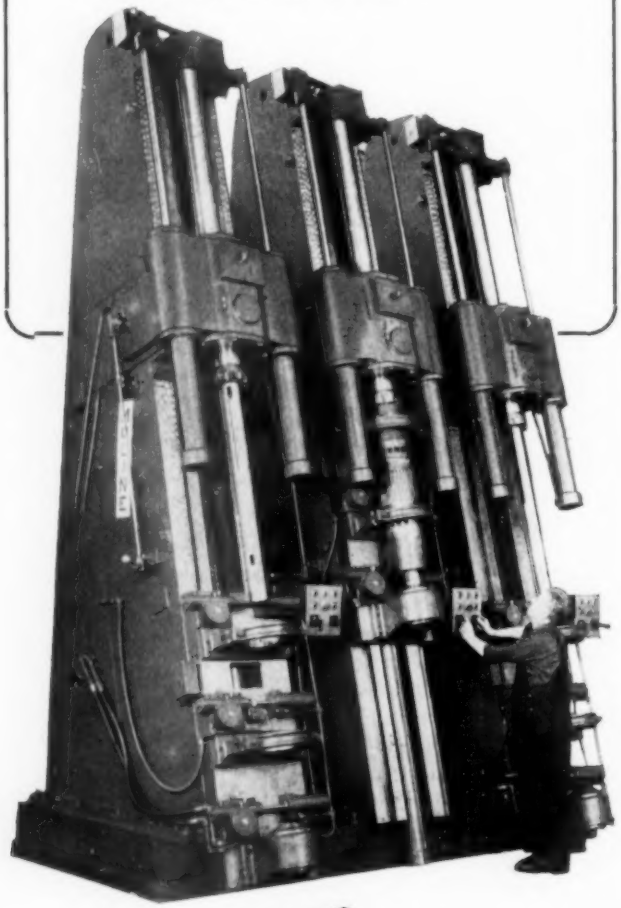


3 of a kind

. . . Bore and Face Giant Diesel Cylinder Sleeves

Here is MOLINE'S answer to a large Diesel engine builder's problem — a special boring machine heavy and rigid enough to accurately bore and face ends of large diameter cylinder sleeves. Illustrated below are three MR-114 Boring Machines, tied together to form one 3-column unit, but each of the three is operated independently. Each consists of a heavy, rigid column with a Boring Spindle Thrust Bearing Assembly and a Work Holding Fixture movable on its inclined ways. Each unit has 2 motors, one to drive the spindle, the other to drive a hydraulic feed mechanism. A shift lever gives 2 rotational speeds for the spindle. The boring tool is piloted below the work. The fixture is set at the extreme "down" position for loading, the extreme "up" position for boring, and at an intermediate location which permits the operator to watch the facing operation.

All functions of the machine are controlled by a combination of push buttons and selector switches, and electrical interlocking prevents possible errors in operating sequence. Automatic lubrication of ways and spindle drive gears assures freedom from troubles occasioned by oversight where manual lubrication is used. The three column unit illustrated covers a floor area 8' 4" x 11' 7", has an overall height of 17' 9" and weighs approximately 77,200 lbs.



MOLINE TOOL CO.
"HOLE-HOG"
MOLINE, ILLINOIS

Since 1901

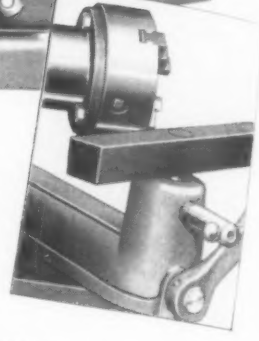
Builders of Special Machinery for Drilling, Boring, Honing and Tapping

Presenting REYNOLDS New POLISHING UNIT

Illustrated here is standard Motor Driven Bench Model.

Moderately Priced.

Showing Chuck Attachment.



Reynolds New Polishing Unit offers the following outstanding features to users—

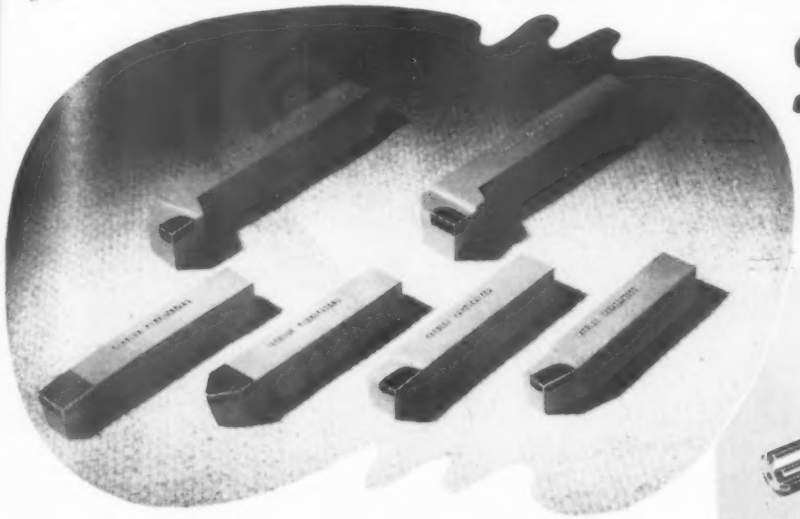
- 1" Collet capacity with 1" hollow spindle clear through.
- Uses any standard motor (not a special built-in motor).
- Has 4-step V-Belt drive.
- Speed range
  with 1725 RPM motor – 1725-900-750-600 RPM
  with 1200 RPM motor – 1200-750-600-450 RPM
  with 3450 RPM motor – 3450-1800-1500-1200 RPM
  (Note: You can purchase machine less motor and use any ½ H. P. motor available in your shop)
- Single lever control, starts–stops–applies brake, opens and closes collet. (Note: spindle may be stopped to inspect work without disturbing setting of piece held in collet.)
- Collets #5C Rivett: a popular size which many plants already have. This same Collet is used on South Bend 16" and 10" lathes.
- Has threaded nose spindle for use of 5" 3 jaw chuck (supplied as an extra).
- Ball bearing spindle assembly.

Write, Wire or Phone Reynolds Machinery Company, Providence, R. I., for further details.

Due to paper restrictions this advertisement will not be repeated in Tool Engineer.

REYNOLDS
MACHINERY CO.
211 EDDY STREET PROVIDENCE, R. I.

These ARE THE CEMENTED-CARBIDE TIPPED TOOLS SUPPLIED AS *Standard* BY CARBIDE FABRICATORS



48 HOUR DELIVERY

ON TURNING TOOLS SHOWN ABOVE

The wear resistance of cemented-carbides is available to you in many different types of standard tools manufactured by Carbide Fabricators.

The standard turning tools shown above—ground ready for use and which also meet many requirements for boring and facing jobs—are produced in large volume to be carried in stock. Simplified pricing of these tools makes possible one low unit price regardless of the number of tools which are ordered.

Reamers, end mills and core drills are all produced to a high degree of accuracy. Machine reamers, shell reamers, end mills and shell core drills are held to size within a total tolerance of .0005". When specified, closer tolerances can be supplied at a slight additional charge.

Complete information on any of these tools will be supplied immediately upon request.

We are authorized suppliers of Carboloy, Vascoloy-Ramet and Firthide cemented-carbides.

Carbide Fabricators Co. ROYAL OAK MICHIGAN

MFRS. OF STANDARD AND SPECIAL CEMENTED CARBIDE TIPPED TOOLS

NEW EQUIPMENT

T. M. REG. U. S. PAT. OFF.

• Materials + Processing •

NEW LINE OF GEARMOTORS (L10)

The Westinghouse Electric and Manufacturing Company of East Pittsburgh recently announced a new line of horizontal parallel shaft type Gearmotors. Said to meet speed reduction requirements for a wide variety of industrial applications over a range of 1 to 75 hp, each unit, according to the manufacturer, conforms to A.G.M.A. standard output speeds and application practices.

Adapter castings are used between motor and mechanical parts. This is said to allow the use of all standard Westinghouse N. E. M. A. frame motors with each type of unit. Thus types of motor construction can be changed to suit varying service conditions.

Replacement of parts is said to be held to a minimum because many working parts, including gear sets, are common to all three unit types of a given rating. Gears and pinions in these new Gearmotors are of .40-.50 carbon steel and are given special heat-treatment before hobbing. Gears and bearings are lubricated by a positive splash system, and the new case design allows the oil to circulate freely at all times.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

INDUSTRIAL CHILLING MACHINE (L11)

New features recently announced by Motor Products Company, Chicago, for its Deepfreeze Cascade Industrial Chilling Machine are a temperature control device, a table top, and a new system of compressors which eliminates need for water connections and drain facilities.

The company states the chiller is able to reach −120° F. and is capable of removing 1,000 B. T. U.'s per hour at this temperature when work is immersed in convection fluid.

In "Cascade" refrigeration, one compressor extracts heat from the barrel, introducing it into a heat interchanger. A second compressor in turn dissipates the heat from the interchanger. Both working compressors are cooled by a third unit. The machine is used for shrinking close-fitting parts to fit, treating steel for uniform hardness, treating gages and arbors to stabilize dimensions, and testing instruments.

AUTOMATIC SLOT CUTTER (L12)

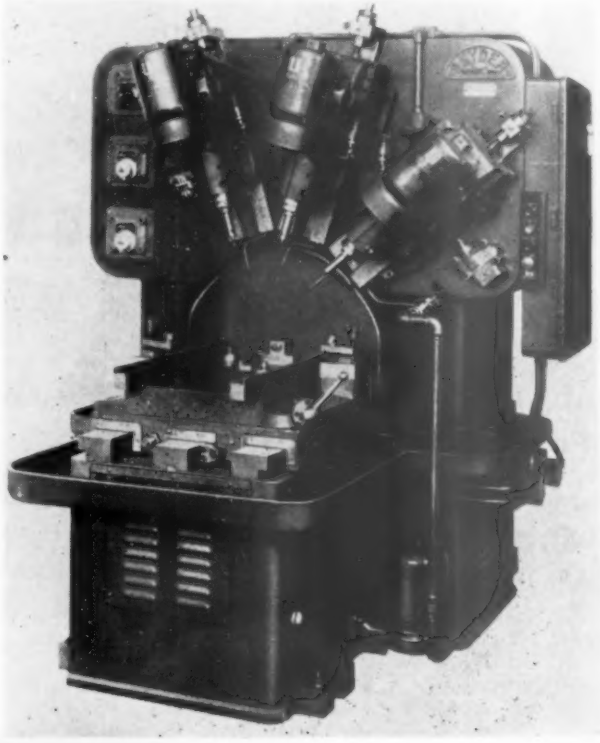
A new special machine for cutting slots for binder bars in forged aircraft cylinder heads has been designed by Snyder Tool and Engineering Company, Detroit.

The part to be worked is placed on a master locating plate and clamped on the fixture table, the manufacturer states. The machine then is started and the tools advance into the work. When the full depth of the cut is reached, the table automatically moves lengthwise and feeds the work against the tools for lengthwise cut. When this is completed, the tools retract automatically.

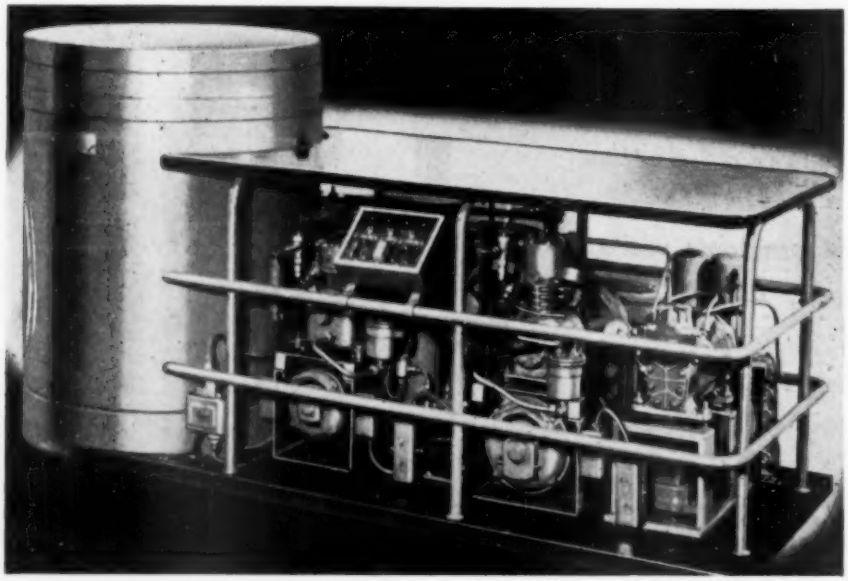
A new part then is substituted for the finished one, and the lengthwise cut is made on the return stroke, so that setting the machine between each cut is eliminated.

Features claimed for the machine by the manufacturer include high speed precision spindles geared for simultaneous operation, hydraulically operated fixture table, and micrometer adjustment screws for taking up wear.

Right: Snyder Special Automatic Machine for Cutting slots.



Below: Deepfreeze Cascade Industrial Chilling Machine.



ELECTRIC SALT BATH FURNACE (L13)

Faster starting, more economical

(Continued on page 166)

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date . . .

Copyright 1943 by The Bramson Publishing Co.

THREE FREE SERVICES without obligation

For your convenience these three business reply cards enable you to request quickly

1: New catalogs — bulletins listed in this issue.

2: Additional information or bulletins relative to new equipment — new materials or new processes.

3: When answering advertisements, specific information on problems or company representative's call.

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail.

Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described.

In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

1

USE THIS CARD

for requesting new catalogs and bulletins listed in this issue.

2

USE THIS CARD

for requesting additional information or bulletins about new equipment, materials, processes, etc.

3

USE THIS CARD

when answering advertisements, to obtain specific information on problems, or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, AUGUST 1943

PAGE NO.

NAME OF ADVERTISER

☐ Literature ☐ Have Representative Call

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

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TITLE

THE TOOL ENGINEER, AUGUST 1943

PAGE NO.

NAME OF ADVERTISER

☐ Literature ☐ Have Representative Call

USE THESE FREE REPLY CARDS

They are provided for your convenience in requesting information and service . . . . .

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER
THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT 2, MICHIGAN

1

Request for:
NEW CATALOGS
BULLETINS
BOOKLETS

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

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THE TOOL ENGINEER
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DETROIT 2, MICHIGAN

2

Request for additional information and catalogs covering
NEW EQUIPMENT
MATERIALS
PROCESSES

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
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DETROIT 2, MICHIGAN

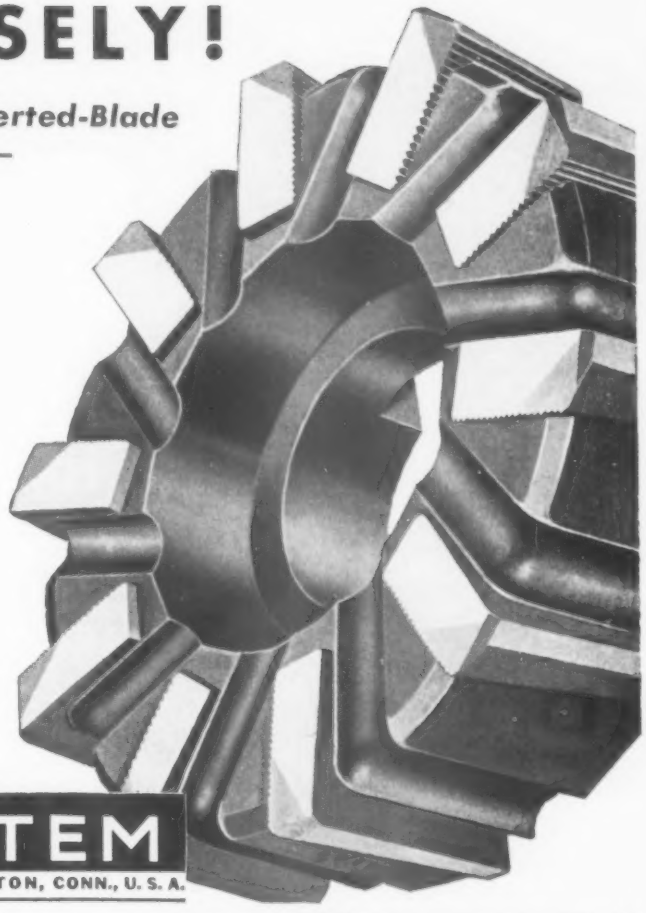
3

ANSWERING ADVERTISEMENTS
Requesting:
LITERATURE
REPRESENTATIVE TO CALL

STUDY IT CLOSELY!

This is one of a wide variety of OK Inserted-Blade Metal Cutting Tools which in this war —

Save MAN-HOURS OPERATION COST AND H.S. STEEL



Milling, reaming, boring, turning, planing — all metal cutting — can be speeded up, and the work improved, by the systematic use of OK Tools. Compared with solid cutters, accuracy is thus easier to obtain and maintain. With an adequate supply of blades and bits at hand, there need be no costly waits for new cutters to fit the job. OK Tools are quickly adjustable in line of wear; the truing and grinding are little more than routine. And, an entire new tool is not necessary for most special cuts; the change can usually be made in the blades.

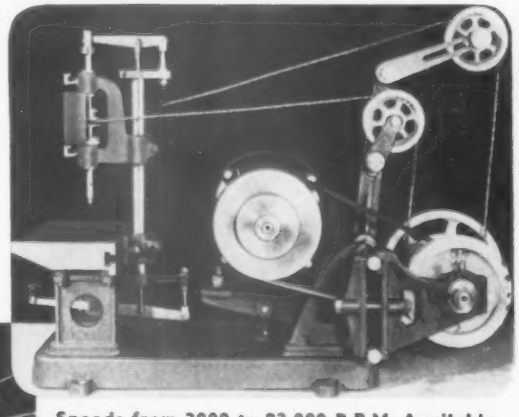
As the bodies of OK Tools are made of alloy steel and only the blades and bits of cutting steel, the saving of critical High Speed Steel, even in a small shop, can be an important contribution to the war effort!

INSERTED-BLADE METAL CUTTING
OK TOOL SYSTEM
MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

FOR PERFECT HOLES FROM .004 TO 1/16"

use a Super Sensitive

L & D HIGH SPEED DRILL PRESS



Speeds from 3000 to 23,000 R.P.M. Available with one, two, three or four spindles.

Super Sensitive is the word for it. Finger tip control, plus precision, balanced construction give perfect holes with maximum production, and a minimum of drill breakage . . . If you build instruments and other tools and parts requiring very small holes —if you demand the ultimate in precision tooling—if you require high production even from green help—mail the coupon today for complete details on the L & D High Speed Drill Press.

Please send me complete details on the Super Sensitive Drill Press.

NAME ..... TITLE .....

COMPANY .....

STREET .....

CITY ..... STATE .....

T.E.

EDWARD BLAKE COMPANY
634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

hold-over, and more uniform, cheaper, more accurate small production heating are advantages cited by the Upton Electric Furnace Division, Detroit, for its new, internally-heated, electric salt bath furnace.

The furnace design eliminates all necessity for changing electrodes and permits hardening of tools that formerly could not be treated in a salt bath because of their length, according to the manufacturer.

Electrodes are sealed through the sides of the furnace in such a way that they can be located beneath the surface of the salt at the extreme bottom of the pot, if desired, with none of the heated portion exposed to the air. Parts of the electrodes exposed to the air are cooled to about body temperature by circulating water.

Considerable power is saved in operation, the manufacturer claims, because the furnace can be operated by merely enough salt to heat the tools. Also, maintenance costs are reduced, since the furnace can be held over with only five inches of salt. Another economy feature stressed by the company, is that electrodes are guaranteed for the life of the pot.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

Upton Electric Furnace

CARBIDE METAL CUTTERS (L14)

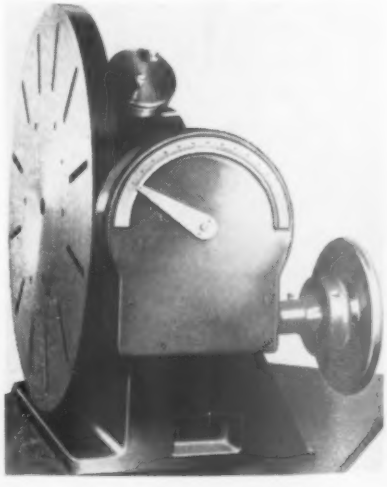
McKenna Metals Company, Latrobe, Pa., has recently introduced a new line of cemented carbide metal cutters. The company says the cutters will enable the metal-cutting industry to obtain peak speed and production on milling operations.

Body of the cutter is shock-resistant, making the tool suitable for fast and accurate face milling, side milling, end milling, slot milling and straddle milling according to McKenna Metals. It employs double negative rake angles for milling steel, and positive rake angles for use on cast iron, aluminum-silicon alloys, magnesium-aluminum alloys, brass, bronze and most other ferrous metals.

MEASURING MACHINE (L15)

Designed especially for simplification of machining and measuring large objects, such as fixtures, castings, patterns, or fabricated parts, a new ma-

(Continued on page 168)



Rotab Measuring Machine

INVESTIGATE Tannewitz DI-SAWS and You'll Want No Other!

A broad statement? Yes. But soundly founded on facts—the experience of numerous large manufacturers—the actual performance records of the machines, themselves—and fundamental superiorities of design and construction.

Larger wheels (24" diameter on the standard models) provide greater traction, faster, straighter cutting, more production. Transmissions, common source of die saw grief, never fail in TANNEWITZ DI-SAWS. Sturdier, heavier construction throughout, plus many refinements of design, make these machines the greatest, trouble-free producers in their field. It pays to buy the best!

With a TANNEWITZ DI-SAW you can do in minutes jobs which require hours by the shaper, miller or lathe methods.

Get the complete facts. Just write for DI-SAW bulletin.

STANDARD MODEL No. M24 (24" WHEELS)

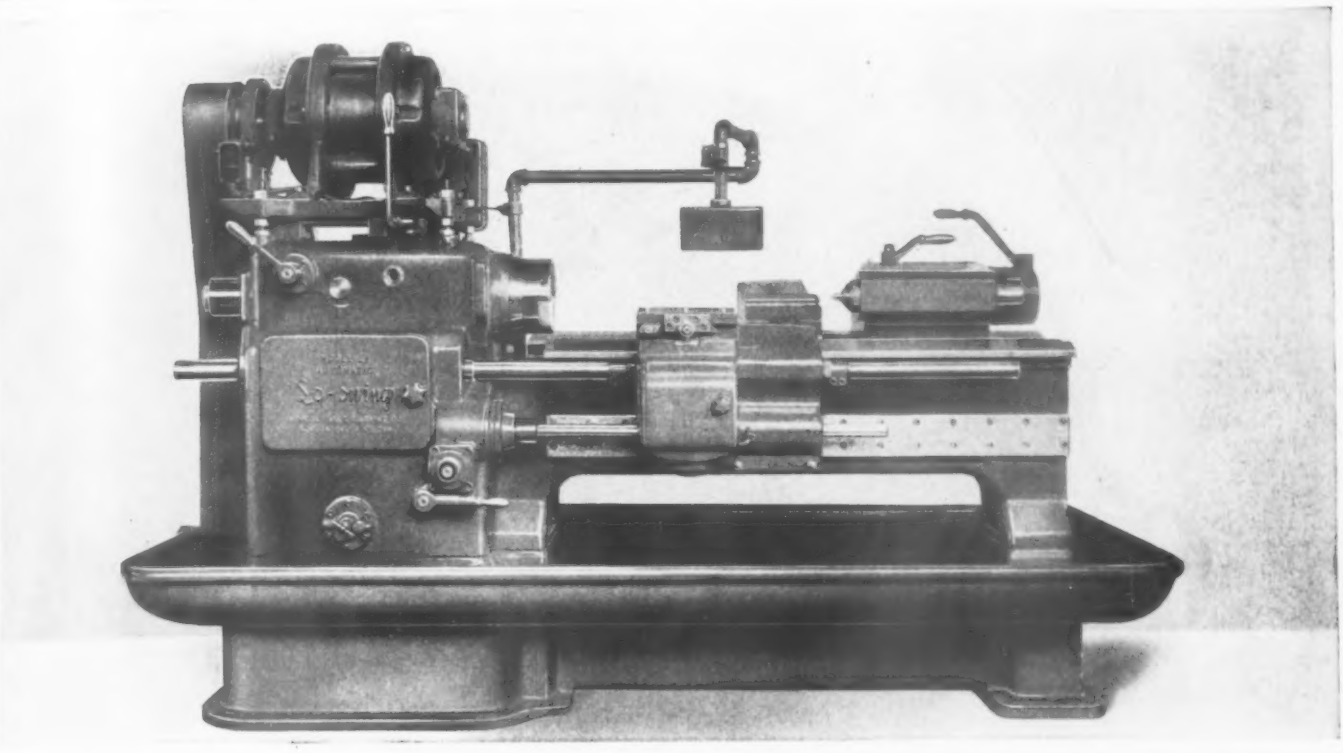
Other Models to Handle Work of Practically Any Size

Made with 30", 36", 48" and even larger throat capacities if desired, the TANNEWITZ "Big Bertha" models make available the tremendous savings of inside and outside sawing, filing and polishing on dies, jigs and other work of practically any size. Write for bulletin.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE *Lo-swing* PEOPLE"** SENECA FALLS, NEW YORK



MODEL LR *Lo-swing* LATHES SOLVE PROBLEM OF TURNING ELECTRIC MOTOR SHAFTS

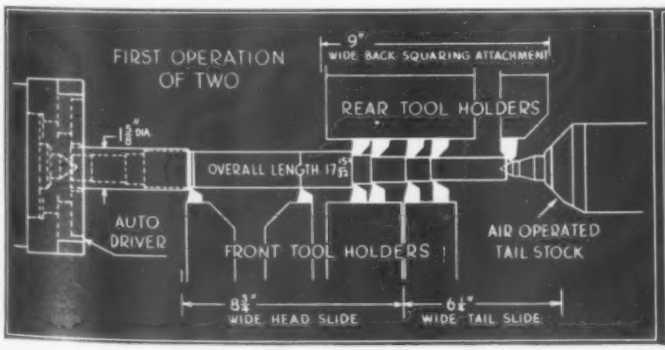
Problem: To provide a battery of automatic lathes capable of increasing production on electric motor shafts, but having the quick change-over features necessary for medium and short run work.

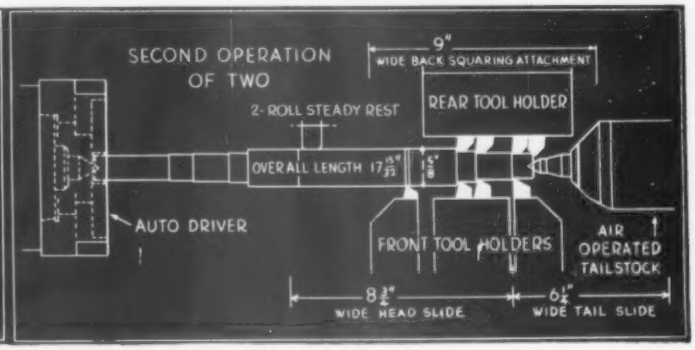
Solution: The Model LR Automatic *Lo-swing* Lathe was selected for this job because of its SIMPLIFIED CHANGE-OVER MECHANISM which makes change-over from job to job merely a matter of a few minutes' adjustment. With this built-in mechanism, length of carriage stroke and rapid traverse movements are quickly adjusted and positioned to readings on graduated dials. Cams are standard and do not have to be changed, and since the cycle is closed and locked, the machine cannot get out of time. Average change-over time is 20 to 30 minutes, depending on the number of tools being used.

Line drawings show the two turning operations on one type of motor shaft. The total length of carriage travel for the first operation is 5-7/8", and a production of 20 shafts per hour at 85% efficiency can be maintained with high speed steel cutting tools.

The total length of carriage travel for the second operation is 2-3/4" and a production of 36 shafts per hour at 85% efficiency can be easily maintained.

Seneca Falls engineers will be glad to assist you with your war production turning problems.





LATHE NEWS from SENECA FALLS

chine called the "Rotab" has been introduced by the Machine Products Company, Detroit.

To use the machine for measuring, the operator clamps the work on a 36-inch circular table, which can be rotated by a turning wheel to any degree and angle from the vertical to horizontal and then 30° below in the opposite direction. Degree and minute angle settings are registered on the dial. A ten inch sine-bar is provided for greater accuracy.

The device also may be used as a holding fixture for boring mill setups. Because it will assume any angle, work clamped to the table can be brought to the cutting tool on a mill without difficulty.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

CENTERING TOOL FOR ROUND BARS (L16)

The Whitcomb Quickcenter, a new tool for centering round bars in preparation for milling on centers, removes the centering operation from lathes and permits operators to center bars quickly and accurately, according to the manufacturer, The Whitcomb Manufacturing Company, Troy, New York.

Work to be centered is placed in a V-block and the operator turns a handwheel which brings the work to rest securely between the block and a lowering button. When tight, the work is exactly in line with the center line of the spindle, and a hand lever moves the drill to the work. The operation takes only a few seconds, the maker states.

Bar-Centering Device

The machine has speeds of 700, 1300 and 2300 r. p. m. and will center round bars from one-half to three inches in diameter within .005-inches.

WELDING POSITIONER (L17)

Ransome Machinery Company, Dunellen, N. J., announces that its new 500-pound-capacity welding positioner is particularly well adapted to work ordinarily handled by women.

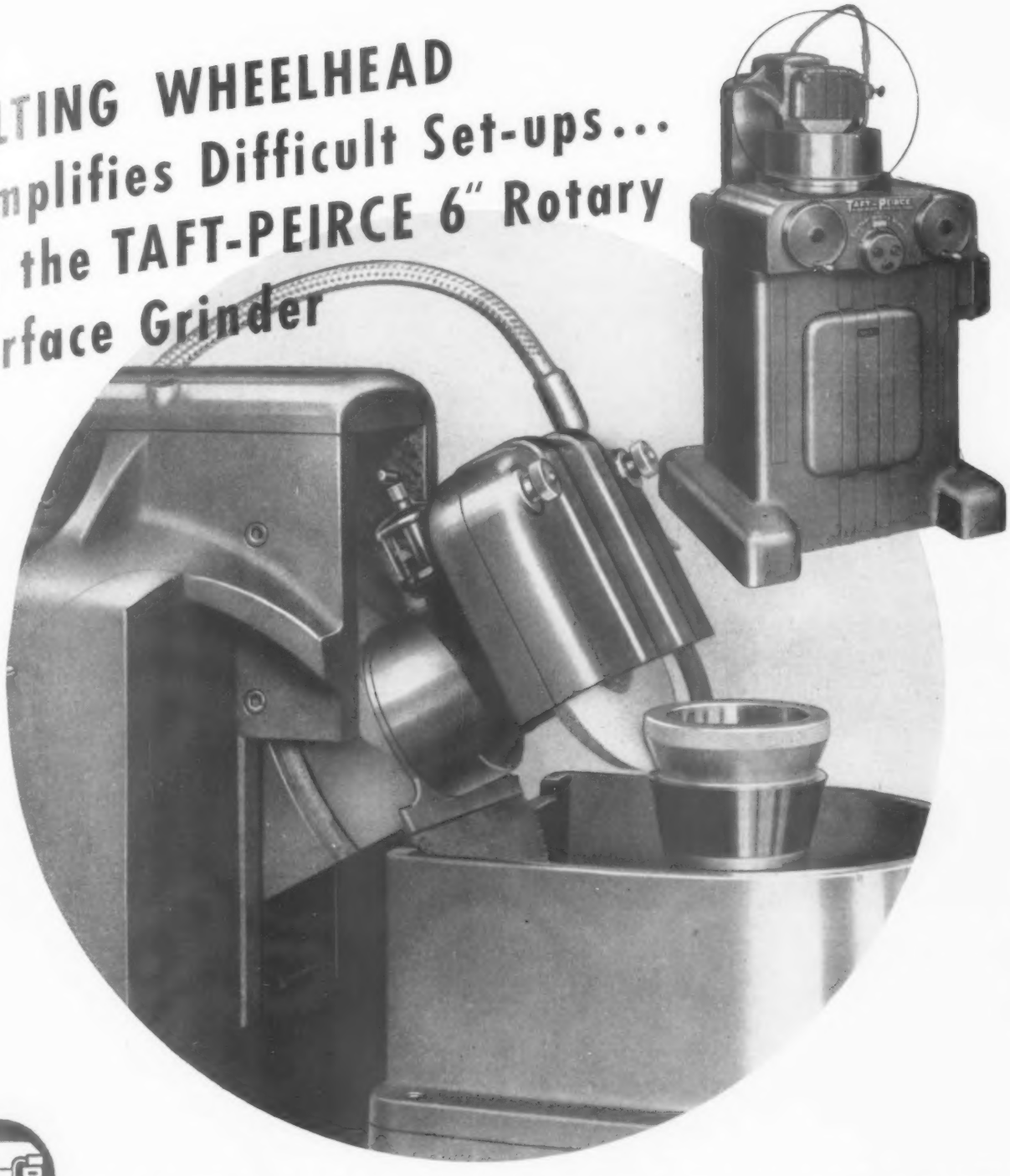
With the center of gravity of load only six inches away from the table top and a six inch eccentricity, the positioner has a tilting range of 135° from

Welding Positioner

(Continued on page 170)

OUR CREED . . . YOUR GUIDE TO SATISFACTION!
We'd rather make a few products WELL than a score of products of indifferent quality. That is why we have specialized for 20 years in making circular metal cutting saws, drills, combination center drills, and reamers.
By thus concentrating our efforts we can streamline our production and maintain exceptionally high standards of quality without correspondingly increasing prices.
The steadily growing demand for Circle "R" Products is convincing evidence that our creed is your guide to satisfaction. Even our enlarged plant, containing 20,000 square feet of floor space, is taxed to the limit to meet delivery requirements.
CIRCULAR TOOL CO., INC., Providence, R. I.
CHICAGO • PHILADELPHIA • NEW YORK • DAYTON • CLEVELAND • SYRACUSE
INDIANAPOLIS • DETROIT • ST. LOUIS
CIRCLE "R" TOOLS
Made by Perfectionists
R

TILTING WHEELHEAD Simplifies Difficult Set-ups... on the TAFT-PEIRCE 6" Rotary Surface Grinder



On all small rotary surface-grinding work, your operators now can produce—with far less effort, in far less time—surfaces which are more accurately flat than those produced on conventional machines. The exclusive design of the tilting wheelhead extends work-range to include difficult angle and shoulder cuts, without complicated set-ups. And the trunnion mounting of the work-spindle permits swiveling the special T-P Magnetic Chuck forward or to the rear through a 7½° angle, which facilities the accurate grinding of piston rings, saws, cutters, gear-shaper cutters, and similar items. In its every part, the Taft-Peirce 6" Rotary is built for long life and undiminished precision, with full ball-bearing construction, hardened and ground ways, and vibration-proofed mountings. Write on your letterhead for new descriptive publication.

The TAFT-PEIRCE Manufacturing Co.

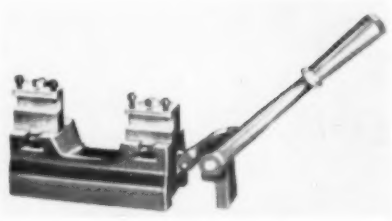
WOONSOCKET RHODE ISLAND

horizontal or 45° beyond vertical, providing a "down under" position for all downhand welds. Free rotation of the table top by hand when required is possible through a clutch arrangement.

LATHE TOOL ATTACHMENT (L18)

Newest in the line of lathe tool attachments offered by Kessler Aero Tool Products Company, Inc., Burbank, California, is a lever operated cross-slide for doing forming and cut-off work in a single operation. It operates without disturbing tool or carriage positions, according to the company.

The attachment is designed to fit



Cross-Slide For Lathe

Craftsman, Logan, 9 inch South Bend, Atlas, and similar lathes. Since the cross-slide fits the dovetail on the lathe carriage, conversion of engine lathes to production lathes in a few minutes is possible, with the change in the opposite direction equally easy, the company points out. Savings of as much as 75 per cent of the operator's time over that used with the hand wheel method have been reported.

WET CUTTING METAL SAW (L19)

Designed especially for high speed cutting, a new model wet cutting metal saw has been placed on the market by the Johnson Manufacturing Corporation, Albion, Michigan.

According to the manufacturer, the non-clogging piston-type pump, cam-driven, automatically starts and stops

Johnson Metal Saw

with the machine. A ram smooths the pump impulse and assures a steady flow of coolant. If dry cutting is desired, the pump may be disconnected easily, it is claimed.

INFORMATION FREE

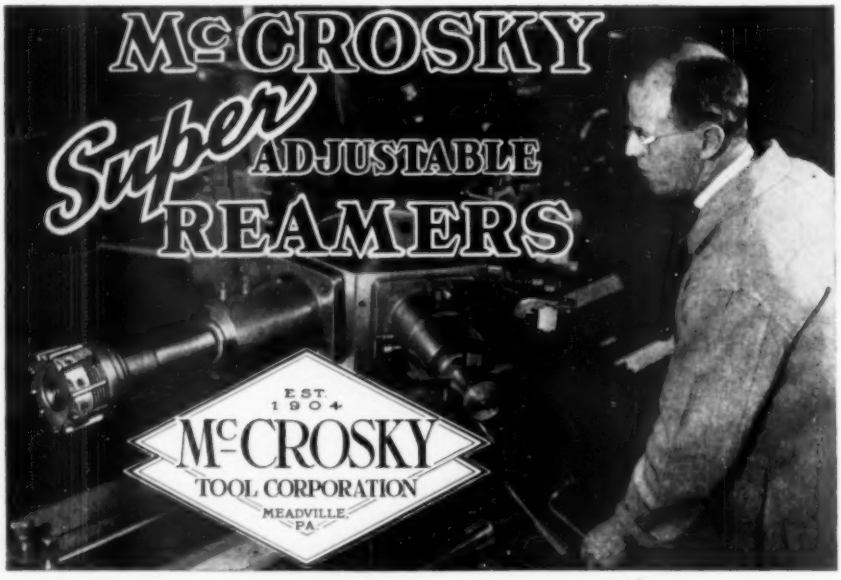
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

ATTACHMENT FOR BRIDGEPORT MILLER (L20)

Use of its new "Hoover Riser" on a Bridgeport milling machine by one manufacturer made possible an opera-

(Continued on Page 172)

Bridgeport Hoover Riser



DO YOU

have a copy of the McCrosky Reamer Manual? This simple, 20-page, illustrated booklet covers the basic principles of the inserted-blade reamer, the fundamentals of reamer grinding and maintenance — information that will help you maintain top production if you are using a McCrosky Super Adjustable Reamer.

Also available are the McCrosky Boring Bar Manual, the McCrosky Quick-Change Chuck Manual, and various bulletins and engineering data sheets covering all units in the McCrosky line of Cost Cutting Tools.

WRITE TO McCROSKY, MEADVILLE, PA.

McCROSKY COST CUTTING TOOLS

◆ SUPER ADJUSTABLE REAMERS ◆ ADJUSTABLE BORING BARS

◆ JACK-LOCK MILLING CUTTERS ◆ WIZARD CHUCKS ◆ TURRET TOOL POSTS

How Heat Treating "Know How" Helped to Lick a Tough Hardening Problem

Here is an on-the-job story of how Carpenter tool steel and the practical knowledge of a Carpenter representative teamed up to solve a tough tool steel problem. The facts are summarized below. The tools and work involved are shown in the photograph.

THE JOB:

Punching 3/4 hard brass (Rockwell B-79), .137" and .150" thick, in a double acting 250-ton punch press. The holes to be punched vary from .099" to .167".

PROBLEM:

Preventing cracking of punches under the head during hardening, avoiding decarburization and keeping the punches straight in quenching. About 75% of the punches hardened had been cracking in the shoulder under the head in the hardening process.

SOLUTION:

The Carpenter representative, when asked for advice, made the following suggestions: First, to use the recommended furnace atmosphere of 2% to 4% oxygen. Second, to switch from a tap water quench to one of 10% brine. Third, to heat the punches in a piece of 3/4" round iron pipe (both ends open)—so that the punches can be dropped vertically into the brine to get a full quench under the head.

RESULT:

On the first try following these recommendations, some 200 punches made from Carpenter Green Label Drill Rod were hardened, using a temperature of 1450° F. with an atmosphere of 2% to 4% Oxygen. The problem was licked! Decarburization was eliminated and all were O.K. for straightness. In production they averaged 100,000 holes per punch.

• If *you* have a tool steel problem—or if you should like help in getting tools that give longer uninterrupted production runs—your nearby Carpenter representative will be glad to give you every assistance. He can supply you with helpful printed matter—he can render personal "on the spot" service—and he will keep you in touch with the Carpenter Metallurgical Department.

THE CARPENTER STEEL COMPANY
122 Bern St., Reading, Pennsylvania

Carpenter MATCHED TOOL STEELS

tion that otherwise would have required using an expensive horizontal boring mill, according to the Hoover Tool & Die Company, Detroit.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

This device, when installed on this miller, facilitates handling of bulky material requiring only a light cut that otherwise might tie up a larger machine, according to the manufacturer. It also is claimed that the "Hoover Riser" may be installed in a few minutes and will increase the overall capacity of the Bridgeport miller six inches without impairing its rigidity.

BASE TYPE HYDRAULIC PRESS (L21)

Colonial Broach Company of Detroit announces a new base type companion model to its "Junior" hydraulic bench press line. Putting the press on a base has made possible its wider use, even to "pull down" type broaching operations, the maker states. A puller mechanism is mounted in the base together with a coolant tank and a pump driven by an integral motor.

Push type operations also may be performed on this press. For jobs not requiring use of a coolant, base and bench types are available without coolant equipment.

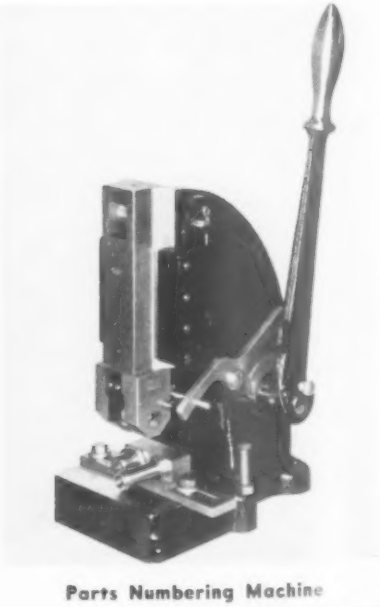
"Junior" Hydraulic Press

Ram speed for the Junior line is 30 feet per minute downwards, making it ideal for assembly and broaching work, it is claimed. Return speed for the upstroke is double the down speed. The stroke is adjustable up to 12 inches.

NUMBERING UNIT FOR INSTRUMENT PARTS (L22)

Serial numbering machines used for serially numbering two or more mating parts with the same number for ease in matching in reassembly have recently been completed by Wm. A. Force & Company, Inc., 216 Nichols

(Continued on page 174)



Parts Numbering Machine

OFFICE OF THE PRESIDENT
Joe—
If that production problem really looks impossible, I suggest you call in La Salle Designing
Ed—
LA SALLE
A LA SALLE DESIGN

One of America's largest technical engineering organizations.

MANAGEMENT ENGINEERING

★ Tool Designing ★ Plant Layout and Routing
★ Process Engineering ★ Product Engineering
★ Designing of Jigs, Tools, Fixtures, Gauges, Dies and Special Machines.

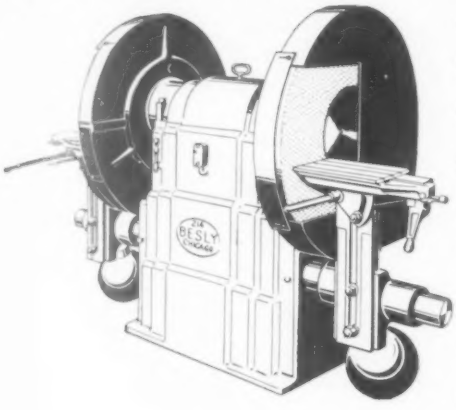
LASALLE DESIGNING COMPANY

AL J. CONN, Managing Director

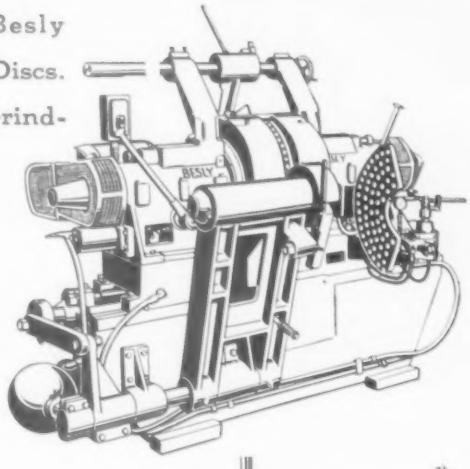
628 West Lake Street, Chicago

BRANCHES IN MILWAUKEE, DETROIT, LOS ANGELES

DISC GRINDERS BECOME REAL PRODUCTION TOOLS



when equipped with Besly Titan Steelbac Abrasive Discs. This modern Bolted-On Grinding Member with 1", 2", or 3" useable Abrasive is fast, cool cutting, safe, economical and easy to mount. In Stud Type and Nut Inserted. Always made of Resinoid Bond.



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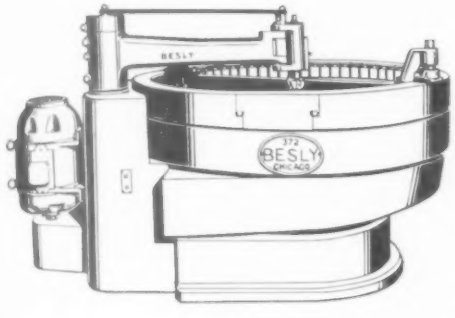
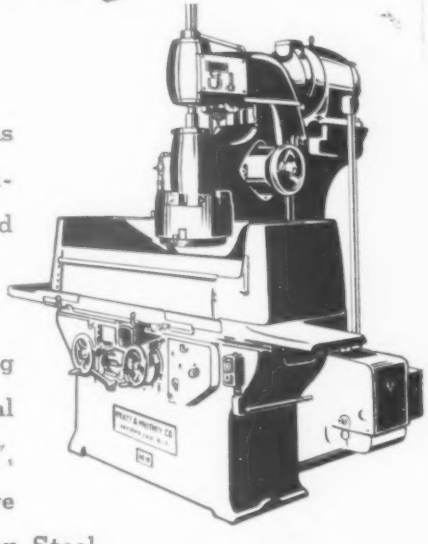


The Besly Titan Steelbac has been adopted by many prominent users of Blanchard and Pratt & Whitney Type Grinders. The Besly Titan Steelbac has eliminated the sulphuring operation and waste incidental to such procedure. You get 3", 4" or 5" of useable Abrasive when you specify Besly Titan Steelbacs for your Blanchard or Pratt & Whitney Type Grinder.



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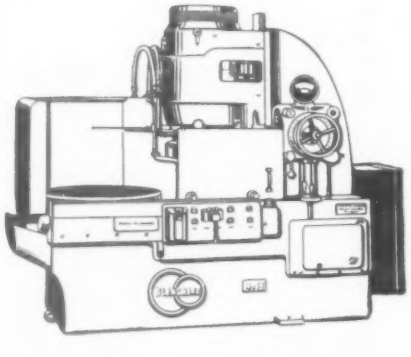
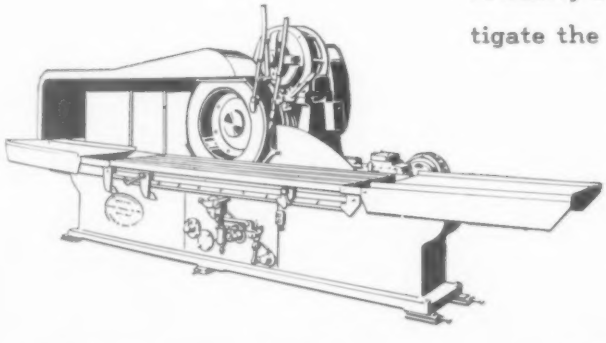


If you operate a Travelling Table Grinder of the Bridgeport, Diamond or Safety Type it will pay you to investigate the advantages of Besly Titan Steelbacs on that machine. Used in connection with such Grinders, they eliminate heavy Ring Wheel Chucks and wasteful stubs. Besly Titan Steelbac Abrasive Discs are furnished in various grains and grades, also proper density depending on the particular application.

Write for your copy of Booklet on Besly Titan Steelbacs



CHARLES H. BESLY & COMPANY

118-124 NORTH CLINTON STREET ★ CHICAGO, ILLINOIS

Avenue, Brooklyn, N. Y.

The hand bench press in the accompanying illustration is fitted with an automatic numbering head with a special trip cam arranged for consecutive, duplicate or whatever type of numbering is required. In this case, the unit shown is assembled with duplicating head for numbering two mating parts of spark plugs for aircraft engines.

The manufacturer states that the press has a modified toggle lever movement which enables the operator to exert considerable pressure for marking hard parts. At the same time, it is claimed that the lever movement allows the operator to control the pressure so well that extremely delicate watch and instrument parts can be numbered or marked without harm.

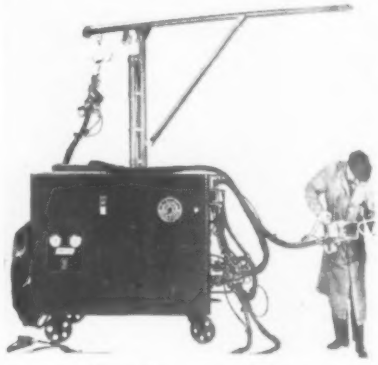
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

MOBILE SPOT WELDING UNIT (L23)

Development of a self-contained spot-welding repair cart has been announced by Progressive Welding Company of Detroit. The unit contains refrigeration equipment for cooling transformers, cables, and guns, eliminating need for water connections and making a power lead the only external connection necessary.

Long cables are provided, enabling the repair cart to be wheeled a considerable distance to a job. The unit is



Portable Spot Welder

equipped with an electronic timer and a wide selection of air-operated and manual "tong" guns making it suitable for all common repair jobs on stainless and other light gage steels, according to the manufacturer.

PROFILE MILLING MACHINE (L24)

A new profile miller especially designed to turn out irregularly shaped pieces has been introduced by the E. A. Thompson Company of Detroit.

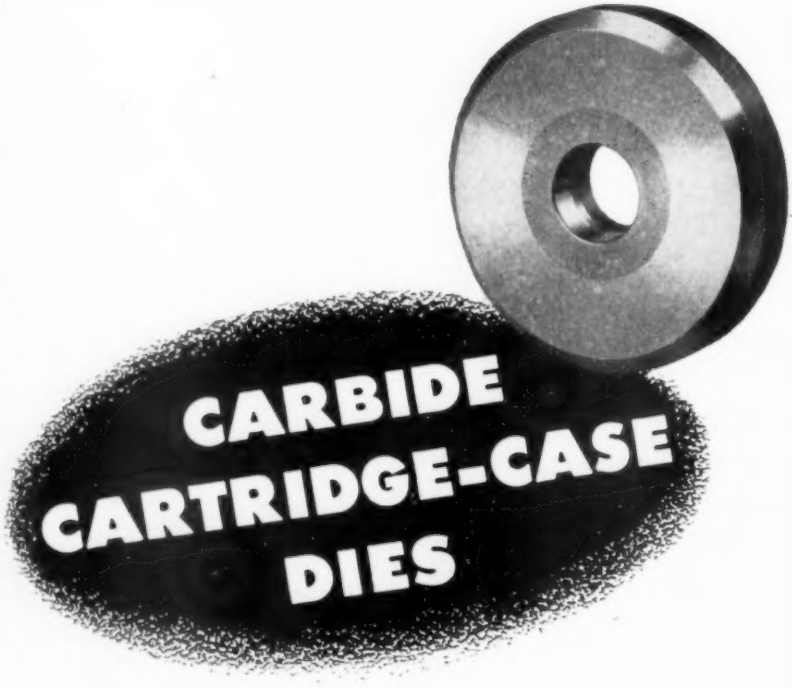
Since the machine is entirely automatic except for loading and unloading, operator fatigue is reduced and fast uniform production of "problem" parts is assured, according to the manufacturer. Work is carried on a rotating

Thompson Profile Miller

table hydraulically controlled by a cam and follower mechanism.

Other features of the machine are

(Continued on page 176)



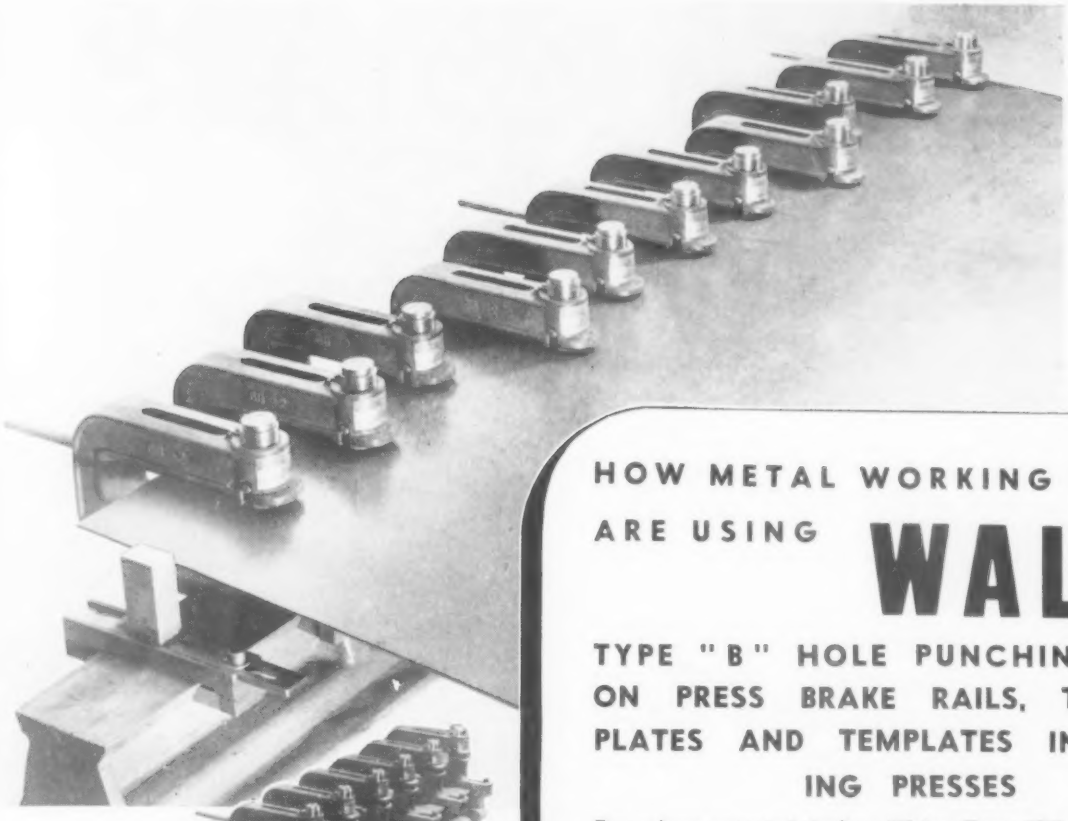
Cartridge-case production can be stepped up—and maintained with Tungsten Carbide Dies because they are made to such close dimensional tolerances. They stand up for long runs, help to produce smooth cases and minimize rejects.

PROMPT DELIVERIES

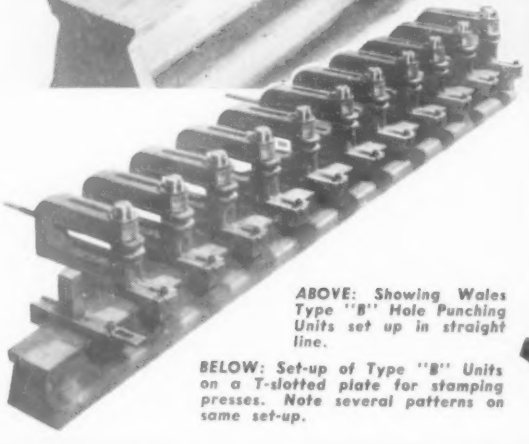
Shipments can be made promptly of any size up to and including 20 mm. size for drawing, necking and sizing of cases. Bullet dies also available in the same size range. Ask for prices, deliveries and other details.

TUNGSTEN ALLOY MFG. CO.

65 COLDEN STREET, NEWARK 4, N. J. formerly Circle Tip Tool Co.

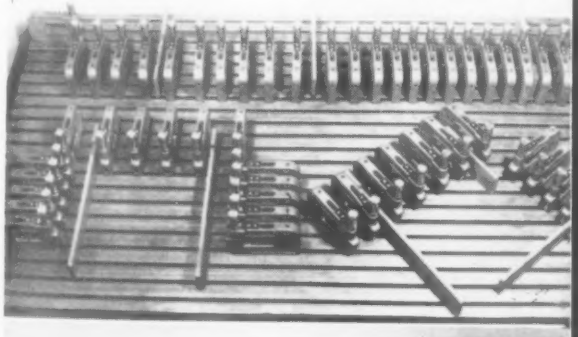


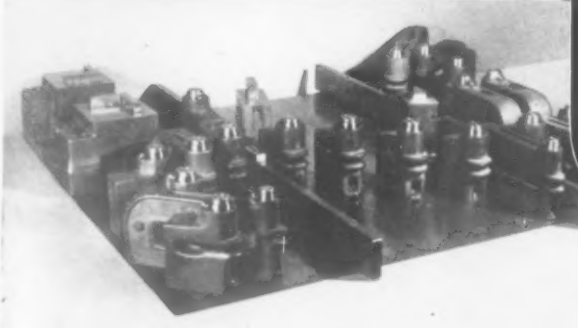
LEFT: Showing staggered pattern set-up for punching holes in sheets on press brakes.



ABOVE: Showing Wales Type "B" Hole Punching Units set up in straight line.

BELOW: Set-up of Type "B" Units on a T-slotted plate for stamping presses. Note several patterns on same set-up.





LEFT: Template set-up of Type "B" Units for stamping presses.

HOW METAL WORKING PLANTS ARE USING WALES

TYPE "B" HOLE PUNCHING UNITS ON PRESS BRAKE RAILS, T-SLOTTED PLATES AND TEMPLATES IN STAMPING PRESSES

By unique patented design, Wales Type "B" Hole Punching Units for punching flat sheets can be used interchangeably on press brake rails, and T-slotted plates or templates in stamping presses.

Set-ups on T-slotted plates and templates are quickly made by simply bolting the units in exact position according to master pattern. Each unit is independent and self-contained with punch and die held in constant alignment by holder. This makes it possible to set the units in any location on plates. Units are easily moved or replaced in set-ups so they can be used and reused to eliminate costly "dead storage."

For press brake set-ups these units are clamped on Wales adapters which are clamped to Wales press brake rail. The adapters are designed for front to back adjustment to provide staggered as well as straight line hole patterns.

Other time-saving, money-saving features built into Wales Type "B" Hole Punching Units:—

Nothing is attached to press ram . . . punch and die holder is a self-contained unit . . . punch and die are always in perfect alignment eliminating the usual time-consuming adjustments required to line up punches and dies of conventional set-ups . . . interchangeable punches and dies to punch various sizes and shapes with same holders . . . die setting time and press "down time" are cut from hours to minutes.

"There's Always Something New in the Wales Line." Keep posted by writing for Catalog "B" TODAY.

WALES - STRIPPIT CORPORATION

353 Payne Ave.,
NORTH TONAWANDA, N. Y.
George F. Wales, President

Specialists in Punching and Notching Equipment

automatic control of feed and rapid traverse, spindle drive clutch, and a built-in pressure and gravity lubrication system. All working parts are fully enclosed for protection from dirt and chips.

PEDESTAL MICROMETER (L25)

Bartelt Engineering Company, Beloit, Wisconsin, announces a new "pedestal micrometer" especially designed for quick and accurate setting of closely spaced boring tools. The gage also is useful in other operations, the company asserts.

Identified as "Model B", the gage consists of a pedestal with a base containing a wide "V" opening and flat surfaces at the end of the extensions. The upright portion of the pedestal is finished on both sides, permitting the arm carrying the micrometer head to be clamped to either side without changing the clamped position of the pedestal.

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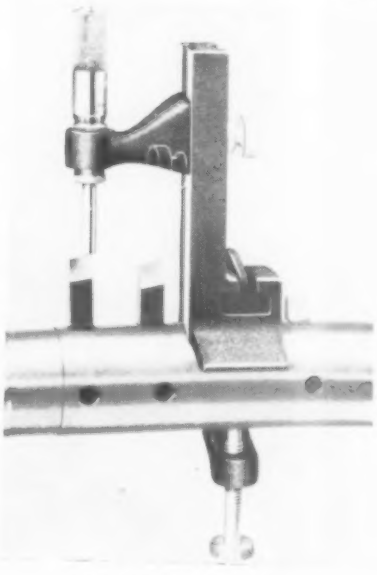
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

The flat surfaces of the base enable the gage to be placed on a surface plate, machine bed, or any other plane surface from which measurements are to be made. The base proper is made so short that the gage will fit between boring tools with as little as 2 inches spacing between them.



Bartelt Pedestal Gage

According to the manufacturer, the Model B may be used also as a height gage, depth gage, for a variety of inspection jobs, and for other machine setups. It carries a standard micrometer, which may be replaced by a dial indicator.

DEEP IMMERSION COOLANT PUMP (L26)

Deeper immersion and ability to handle coolants containing grit and abrasives without injury to the mechanism

(Continued on page 178)

Long Shank Coolant Pump

SKILSAW brings
production-line speed to
crating and car-loading jobs!
EVERY MAN
COUNTS FOR MORE
USING SKILSAW TOOLS!
Put your shipping rooms on a real production basis with SKILSAW to speed all sawing. This powerful, easy-handling saw goes to each job and saves material handling. It pre-cuts lumber to uniform lengths and widths for quick assembly into crates. It sizes 2x4's swiftly and accurately inside the car for freight-car bracing. SKILSAW speeds uncrating, too . . . protects contents from damage in opening and salvages crating lumber for other uses.
Whatever the sawing jobs in your plant . . . in shipping, receiving, maintenance or production departments . . . SKILSAW will do them faster, better and with fewer men. Ask your distributor for a demonstration of SKILSAW now!
SKILSAW, INC., 5051 Elston Ave., Chicago
New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans • Dallas
Los Angeles • Oakland • Portland • Seattle • Toronto, Canada
SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

NEW ENGLAND

New England form tools, reamers, boring tools, centers, etc. are tipped with any make or grade of carbide specified by you; precision ground on diamond wheels; then checked and double checked on the latest type of contour inspection equipment. They are made to your specifications—exactly! Thus you can expect, and get, long life with highest accuracy. We will be pleased to arrange production schedules to supply your standard and special tooling requirements.

NEW ENGLAND CARBIDE TOOL CO.
60 BROOKLINE STREET, CAMBRIDGE, MASS.

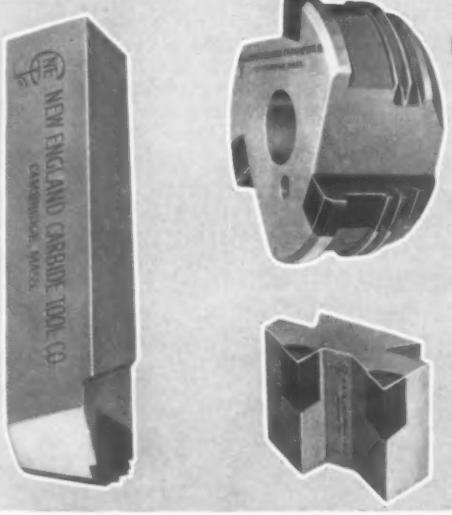
REAMERS

CENTERS

BORING TOOLS

FORM TOOLS

CIRCULAR FORM TOOLS



Please send me your new folder and wall chart covering New England Standard Carbide Tools.

TITLE _____

NAME _____

COMPANY _____

STATE _____

STREET _____

CITY _____

T. E.

CARBIDE TOOLS

are features claimed for a new coolant pump recently introduced by the Ruthman Machinery Company, Cincinnati, Ohio.

No packing glands or friction seals are used in the pump, which the company states has been thoroughly tested and found to withstand injury from abrasives found in some coolants. There are no metal-to-metal contacts below the integral mounting flange forming a simplified installation in connection with a comparatively deep reservoir.

The pump is designed for deep immersion. Ball-bearing construction is used to maintain rigidity and to eliminate change in the position of the impeller before and after the motor reaches normal operating temperature.

The pump is available in two lengths, measured from the mounting flange to the bottom of the pump—23⅝ inches and 19⅝ inches. The motor, which is totally enclosed, is available in ½ h. p. for continuous duty or ¾ h. p. for extra heavy service.

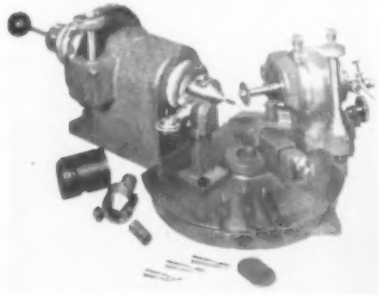
SPIRAL BIT RECONDITIONER (L27)

Onsrud Machine Works, Inc., Chicago, has developed and made available a new machine designed to resharpen spiral routing bits to their original factory condition.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

The company says the bit to be sharpened is held in a chuck and moved to and away from the grinding wheel by a hand lever. Cam control of the



Onsrud Bit Sharpener

feed gives the proper bit lead. Dust is blown from the lapped surfaces by an automatic bellows. The motor assembly swivels for proper alignment for any grinding angle, and hand screws control the vertical lift.

ADAPTABLE HOLE PUNCHER (L28)

Wales Strippit Corporation, North Tonawanda, New York, has announced a new type hole punching unit with built-in adjustable adapter that provides an adjustment up to 1½ inches front to back for off-center or staggered hole patterns when used in set-ups or press brakes.

According to the manufacturer it is possible to locate these units in position by sliding them along the rail. They can be moved from front to back on the new adapter and locked into position in cases where holes are off the straight-line pattern.

CARBIDE-TIPPED MILLING CUTTER (L29)

A new type carbide-tipped milling cutter, with a rate of feed said to be

Carbide-Tipped Cutter

more than 600 per cent heavier than with regular high-speed steel cutters.

(Continued on page 180)

PRODUCTION GRINDING

Simplified!

FLEXIBLE

Attach a Dumore Precision Grinder in any position to any machine tool — for external or internal grinding.

DURABLE

Exclusive design features and precision manufacture give Dumore the stamina for long hours of precision work.

ECONOMICAL

Equivalent investment will supply more grinding facilities in Dumore Precision Grinders than in any other way.

● When Scully-Jones & Company were called on for greatly increased production of precision cutters, reamers, drills and similar tools needed by their customers for war production, they faced a serious shortage of cylindrical grinding machines. The difficulty was solved by mounting some 24 Dumore Precision Grinders on various available bases, with only a small amount of rebuilding. Thus, at negligible cost, they provided a formidable battery of precision grinders sorely needed to augment their production facilities. Ingenuity triumphed and the resulting production of their grinding department is convincing evidence of the practical efficiency of Dumore Grinders.

Explore the full possibilities of the "Dumore System" in stepping up the precision—and the volume—of your products! Ask your distributor for full details—or write for complete catalog today!

The Dumore Company, Grinder Division, Racine, Wisconsin

Dumore PRECISION GRINDERS

The Heart of the Grinder is the Quill!

DUMORE PRECISION GRINDERS ARE SOLD BY AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL CITIES

at threats to stud setting speed and efficiency!

HERE'S an Apex stud setter of brand new design, with the smallest O.D. we know of. It works close to shoulders, projections, etc., drives easily and accurately in tight spots normally hard-to-reach. Proves to be a simple, effective tool for either hand or power operation. *Important:* It's an ideal tool for "green" hands. It's easy to adjust, and once set for desired length of thread on stud, *stays adjusted.*

Four sizes supplied for studs up to 1¼" in diameter. Your choice of Morse taper shanks, hex drive, T-handle combination with female square for torque wrench.

Stud setters are only one branch of the Apex family of fine production tools. Write for any of these catalogs listed below.

Chuck and tool holders: Catalog No. 14; Power bits and hand drivers for Phillips screws: Catalog No. 15; Power bits for slotted head screws: Catalog No. 16; Power bits and hand drivers for clutch head screws: Catalog No. 17; Stud setters: Catalog No. 101.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

now is being offered by Super Tool Company, Detroit. Body of the cutter is cast alloy.

A minimum number of flutes necessary for various classes of work is a feature of the new tool. According to a company announcement, the new cutters are constructed so simply that low cost production permits their use on short runs and general shop tooling.

Greater operating speeds lead to increased table feeds, resulting in finishes comparable to ground surfaces. Other advantages cited for the high speed are increased accuracy and less heat to be absorbed by cutter and operator.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 183.

NEW ROCKWELL TESTING DEVICE (L30)

Clark Instrument Company, Dearborn, Michigan, has introduced a new device for "Rockwell" testing. Features outlined by the manufacturer include a frictionless spindle, zero drag tip to eliminate friction on the loading beam, dial indicator adjustment, and minor load adjustment. Also, the instrument

Rockwell Tester

has a fully enclosed elevating screw and adjustable steady rest.

A diamond cone penetrator and steel ball penetrators are supplied for testing on most standard Rockwell scales. Three anvils are included in addition to the two small "V" anvils which form part of the steady rest.

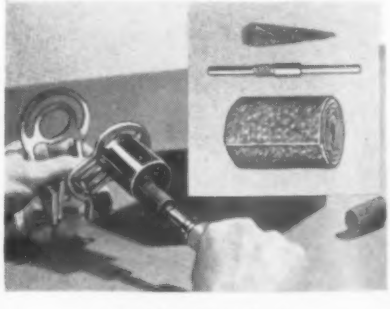
NEW DIAMOND DRESSING TOOL (L31)

Wheel Trueing Tool Company, Detroit, reports that increases in production up to 500 per cent and costs lowered as much as 75 per cent have been obtained by users of its new type diamond dressing tool for thread grinding wheels.

The new tool claims the hardness of natural uncut diamonds and is shaped to permit straight, angle, radial and multiple-form dressing. Other advantages described are longer periods between dressings, resulting in less idle machine time, and production-basis manufacture and re-servicing, assuring quicker delivery.

ABRASIVE WHEEL (L32)

Flex-Abrasive Company, Chicago, announces a new line of abrasive wheels



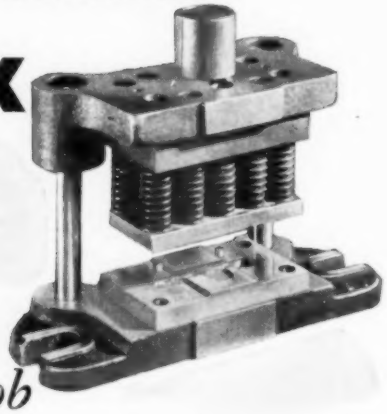
Flexible Abrasives

and points that place a fresh cutting surface constantly in contact with the work and allow full use of the spiral roll down to the last layers.

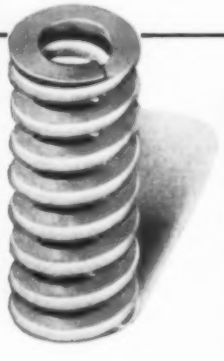
The company claims the wheel and

(Continued on page 182)

FASTER, FINER DIE WORK



By using the Die Spring Tailored for the Job



WARTIME die work demands greater speed and accuracy. You can meet this demand by using the die spring tailored to the job... and to the press. Customized die springs for each particular requirement are available at Muehlhausen; in series "S" for high speed, "M" for regular speed, and "HD" for heavy duty presses. Over 200 sizes are stocked, ranging from 1 to 15 inches in length, from ¾ to 4 inches in diameter, and from 80 to 3000 lbs. in load capacity.

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
625 Michigan Avenue, Logansport, Indiana

WRITE FOR FREE DIE FOLDER!

Illustrates and describes die springs in 206 sizes and types.

Muehlhausen Spring Corporation
625 Michigan Avenue,
Logansport, Indiana
Send Die Spring Booklet, Free.

Name_____

Address_____

City_____ State_____

MUEHLHAUSEN SPRINGS

EVERY TYPE AND SIZE

For Tapping brass, bronze, aluminum, plastics, cast iron or steel—the wide range of Winter Brothers precision-built taps will insure top production results—rapidly and accurately.

The Winter Tap Data booklet offers some practical suggestions in selecting the proper taps to use in these materials—and THE RIGHT TAP IS IMPORTANT in producing smooth-finish threads. Send for your copy today.

Always specify the material in which taps are to be used, so we can help you do your thread cutting quicker and better.

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THE NATIONAL TWIST DRILL & TOOL CO.

DETROIT, MICHIGAN

Winter Brothers

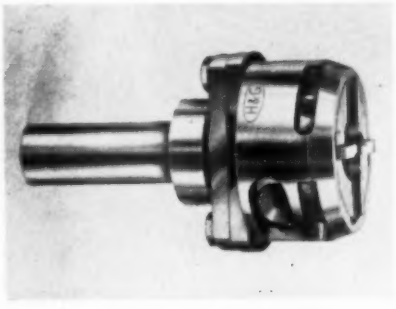
COMPANY Wrentham, Massachusetts, U.S.A.

points are especially useful for deburring exterior edges and finishing hard-to-reach irregular surfaces, such as corners, holes, and openings. They come in types and sizes for use on hard alloy steels, rubber, resin, wood, and plastics.

According to the manufacturer, an inexperienced operator can quickly remove or replace a wheel or point from the mandrel without use of tool, nets, split shafts or grommets.

ADJUSTABLE INSERT CHASER DIE HEAD (L33)

The Eastern Machine Screw Corporation, New Haven, Conn. has recently introduced a new style light-weight, low-cost, solid adjustable insert chaser die head. It was developed for use on all sizes of Browne & Sharpe automatic screw machines.

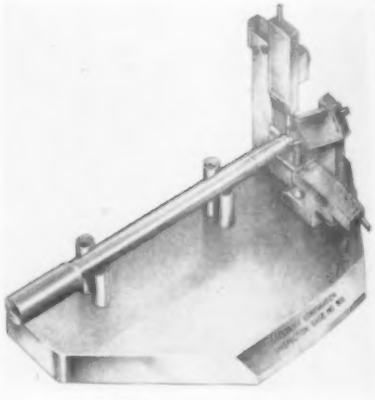


Chaser Die Head

The manufacturer states the chasers used are made of high speed steel and usually will produce from four to ten times the number of pieces obtained from solid dies. They are easily removed for grinding.

INSPECTION GAGE (L34)

The final inspection gage recently announced by the Salsbury Corporation of Los Angeles is said to have been developed by this concern in answer to a need in their own shops for a method of speeding up final inspection of draw punches.



Salsbury Inspection Gage

Known as the Salsbury Corporation Inspection Gage No. 508, it requires only 1/6 of the time formerly needed for checking draw punches. It consists of a machined base approximately 14 inches long on which is mounted the necessary tool supports and three Koch test indicators. This allows the checking of the three taper diameters on the draw punch at one time.

The manufacturer and user of this gage states that the gage is not necessarily limited to checking draw punches since it can be adapted to other tools. The gage is not for sale but the Salsbury Corporation is offering the idea to other manufacturers with similar production inspection problems.

VERSATILE TORQUE WRENCH (L35)

Tubing Seal Cap Company, Los Angeles, California, announces that its Livermont Torq-Snap wrench is especially adapted to operations in dark or noisy places.

The wrench is set to the proper load for the nut to be tightened and when this point is reached, a signaling device gives an audible click and a small tickler taps the operator's hand.

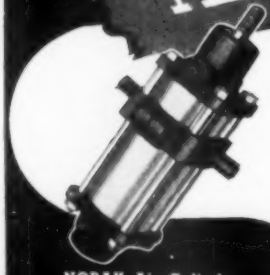
Also, the maker states, the handy shape of the tool adapts it to awkward places.

(Concluded on page 184)

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

"Victory Thru AIR POWER"



...in the Battle of Production

NOPAK Air Cylinders provide smooth dependable power for a wide variety of pulling, pushing, hoisting and clamping jobs . . . in machine shop and foundry, in welding and dipping operations, on stamping and forming presses, on the production line!

By eliminating manual effort in routine tasks, they release skilled man power for more important work. By replacing inefficient mechanical methods, they eliminate costly delays, speed up production, reduce operating costs.

Rugged construction, quality materials and exclusive design features give NOPAK Air Cylinders the strength and stamina required for long service-life in the most strenuous wartime duties. Specify NOPAK Cylinders for "Victory" production in your plant.

NOPAK Air Cylinders may be cushioned at either end ... with Adjustable or Self-Regulating Cushion heads. Six standard mountings.

NOPAK Heavy Duty Cylinders are extremely rugged, have cast steel heads. Cylinder flanges welded to body eliminate tie-rods. Oversize piston rods if needed.

Write for Bulletin 82-A.

GALLAND-HENNING MFG. CO.
2757 S. 31st Street Milwaukee 7, Wisconsin

Representatives in Principal Cities

NOPAK VALVES and CYLINDERS
DESIGNED for AIR or HYDRAULIC SERVICE

A 3988-½I-R

STERLING 1000

New Electric Portable Sander

Tough . . . Efficient . . . POWERFUL!

Smooth out operator jitters . . . and smooth out production problems at the same time—with the "Sterling 1000" . . . Power to spare, rapid cutting, yet its scientifically engineered, counterbalanced mechanism operates without trace of vibration! Built like a fine watch, but extra *sturdy* and *tough* for a thousand types of production.

Designed on New Sanding Action Principle!

Orbital, circular, thousands of abrasive grains cut furrows which cross and recross each other. With this action, the "Sterling 1000" cuts faster—produces the smoothest surface on wood, metal, plastic or composition. Ideal for many rubbing and polishing operations.

Write today for your copy of the New "Sterling 1000" folder, describing 21 important features *in detail.*

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SPEED TREAT STEEL

A MEDIUM HIGH CARBON OPEN HEARTH PRODUCT

ONE
Steel that gives you . . .

1. Excellent machinability
2. Greatly extended tool life
3. Good finished parts
4. High physical properties
5. Excellent impact resistance
6. Good torsional values
7. Minimum distortion
8. Fine heat treatability

ACTUAL PHOTOGRAPH
Speed Treat Steel (.45 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.

The high physical properties, excellent impact resistance, torsional values, minimum distortion and heat treatability PLUS its fast machinability (170 S.F.P.M.), extension of tool life and splendid finish all in ONE steel permit its replacing several comparable steels used in your production.

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★ WRITE US FOR DETAILS
Our metallurgists are at your service

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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

—NEW EQUIPMENT—

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

SUCTION CHUCKING SYSTEM (L36)

Newest wrinkle in methods of holding articles in place for grinding, polishing, beveling, or other operations is a suction chucking system developed by Leiman Bros., Inc., Newark, N. J.

The device utilizes a strong suction of air to hold in place articles made of metal, glass, plastic, wood or other materials with a reasonably flat surface. In most cases a hollowed-out chuck having a connection to the suction line and a series of counter-sunk holes in the surface may be used. For lathe work, a rotating vacuum chuck is available.

Any degree of holding strength needed for a particular operation is attainable with the system, according to the manufacturer. The vacuum pump is equipped with a separator to prevent any foreign matter being sucked into the pump.

ALL-PURPOSE HOLE CUTTER (L37)

A new tool for cutting holes in boiler plate, pipe, plastics, hard fibre, stainless steel, and other "problem" materials has been introduced by Robert H. Clark Company, Los Angeles.

Holes are clean and require no afterreaming, grinding, or filing, according to the manufacturer.

The cutter can be used in drill presses, pneumatic motors, electric drills, milling machines, and lathes. Bits are spaced 120 degrees apart, the maker states, so that chips and shavings are dislodged without clogging.

Two models of the cutter have been designed for cutting holes through curved surfaces, such as pipes and cylinders.

HIGH FREQUENCY INDUCTION HEATER (L38)

Rapid heating of selected areas, accurate and automatic control of amount and distribution of heat, conservation of critical alloy steels, and simplified operation are features outlined by General Electric Company for its new line of electronic heaters.

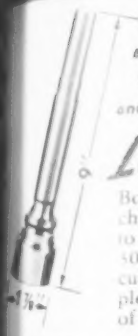
The devices utilize high-frequency induction heating of metal parts for brazing, soldering, and selective heat treating. Operation is simple, according to the manufacturer. After the machine is adjusted to the desired heat the operator sets the dial switch for automatic operation. Repeated heats are made by locating the piece in the inductor coil and starting the automatic cycle by pushing a button. Tubes have an average life expectancy of from 5,000 to 10,000 hours.

WELDING ELECTRODE (L39)

A new all-position electrode, said to be especially designed for use with A. C. transformer welding machines, was recently made public by the Harnischfeger Corporation of 4460 West National Avenue, Milwaukee, Wisconsin.

The manufacturer states that it is suited for all mild steel applications.

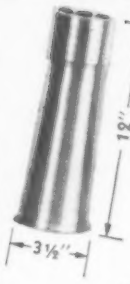
THE END



From 30 Minutes
and all of operator's time
to 15.8 Minutes
and half of operator's time

Lot Size 200

Both operator and machine worked to capacity to obtain one part every 30 minutes. Time was cut to 15.8 minutes, complete lot finished in half of operator's time.



From 17 Minutes
to 7 Minutes

Nine different sizes of these airplane propeller shaft sleeves are turned on a Sundstrand Automatic Lathe. Set-up change-over is less than 30 minutes. Quick set-ups for short runs are made easily.

Lot Size 200

From 45 Minutes
to 5 Minutes

Lot Size 30

One of approximately 100 different jobs turned on two Sundstrand Automatic Lathes.

Lot size on the other jobs ranges from 25 to 100 pieces

One man operates both machines. Set-up time on all jobs averages 45 min.; savings run as high as 95% over former method.

Are You Losing TIME on Jobs Like These?

Sundstrand Automatic Lathes Increase Production on both Short-Run and Mass Production Turning

These examples of time savings available from Sundstrand Automatic Lathes have been taken from the actual experience of only a few of the many users of this modern equipment.

All of the advantages of multiple-tool turning are available on *both* short-run and mass production work. Study these brief sketches and compare the production figures with parts similar to yours...then get the whole story for equivalent or better savings on turning work in your own plant.

(Above) Installation view of Model 10 Sundstrand Automatic Lathes machining gear blank shown at extreme right, above.

These Exclusive Features Make It Possible to Obtain This Higher Production

Seven machine design features govern the possibility of turning short-run work on Automatic Lathes otherwise limited to mass production turning only. They include (1) Wide range of carriage cycles, (2) Adequate feeds and speeds, (3) Quick cycle change, (4) Simplicity of adjustment, (5) Adequate power, (6) Automatic cycling and (7) High rapid traverse rate. Sundstrand Automatic Lathes have all seven. One of the most important of these is:

Quick Cycle Change for Faster Set-ups . . .

Quicker set-up and easy change-over are possible because of the Sundstrand simple cycle control. This control eliminates making cams for every job to be turned. Another important feature is a:

Wide Range of Tool Action . . .

A wide range of action for front carriage tools is provided by three units used separately or in combination. Many combinations are possible by merely making simple adjustments.

How to Turn Short-Run Work Faster . . . is illustrated in this booklet. Quick set-up and easy change-over features are described in detail. Write for yours today. Ask for Bulletin 815

(Right and below) Cycle Control Disk

Let Sundstrand Engineers Help You Select the Proper Automatic Lathe to Suit Your Work

. . . and make tooling suggestions for faster turning of *both* short and long-run work. This competent staff of engineers is available to study your problems and suggest changes for increased production, lower costs. Send complete, accurate information with each inquiry.

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

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NEW LITERATURE

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OF INTEREST TO PRODUCTION EXECUTIVES

(800) Hydraulic Cylinders

Hanna Hydraulic Cylinder Catalog. 32 pp. Hanna Engineering Works, Chicago, Ill. This book gives detailed information on all Hanna cylinders and is a guide to selection of the right type for a specific job. It also includes mounting arrangements; schematic drawings and dimensions of each model; velocity of piston alignment charts; a chart of capacities; data on cushioning cylinders, and information on Hanna hand and foot operated valves.

(801) Machining

A New Precision Machining Method. 32 pp. Porter Cable Machine Co., Syracuse, N. Y. This well-illustrated book shows applications of the company's "wet belt" surfacer to many tool room jobs and includes information about the many operations performed by both wet belt and dry belt surfacers. Also, it lists the various models of surfacers, sanders, milling machine attachments, shapers, and saws made by the company.

GET BIG PRODUCTION FROM UNSKILLED WORKERS!
Every dollar invested in
BOICE-CRANE SAFETY-ENGINEERED PRECISION-BUILT SHOP-TESTED **POWER TOOLS**
does the work of two spent on oversize machines
You can get QUICK DELIVERY from Boice-Crane

***Perform Production Miracles with the* BOICE-CRANE No. 2600 HELMET HEAD DRILL PRESS**

Over 60 Models

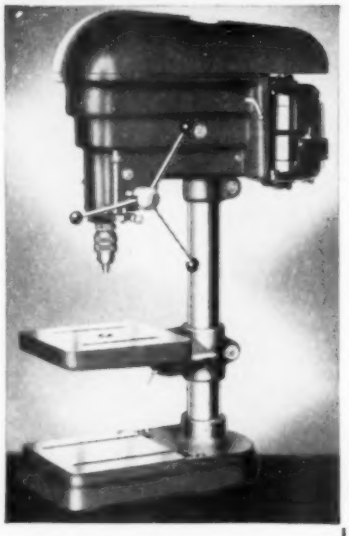
One, two, three and four spindle types. High and slow speed; bench or floor type; slotted or trough table.

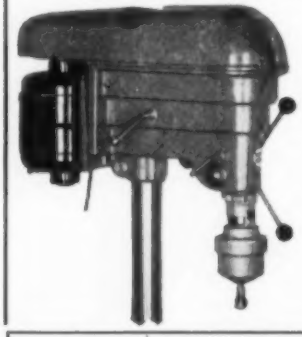
Perfectly balanced. Vibrationless.

Sealed against hazards common in other presses. The only drill press under $100.00 with an approved guard; the first guard that allows easy speed changing.

5 carefully predetermined efficient speeds, one for every operation. New self-centering 30-degree pressure angle 6-tooth involute spline. Spindle, quill, and spindle-pulley are held in permanent, perfect alignment.

The longer, larger diameter quill is held by three bearings, permitting long holes to be drilled more accurately than by other presses in same price range. The most durable, sensitive press in its class.





BOICE - CRANE TAPPING HEADS
for Helmet Head Drill Presses

Do light tapping better, cleaner, more economically. Operate at 3000 r.p.m. "IN"; faster than others, and 6000 r.p.m. "OUT". Taps enter every hole centrally and without slightest strain. 2 sizes.

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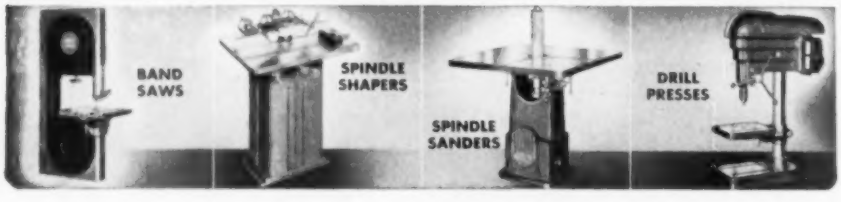


(802) Lathes

Series 900 and Series 1000 South Bend Turret Lathes. 12 pp. South Bend Lathe Works, South Bend, Ind. This catalog describes and illustrates all available lathes in both the 900 and 1000 series. The book tabulates all specifications, dimensions, capacities, speeds, and feeds for easy reference.

(803) Grinding and Polishing

Hammond Cylindrical Finishing Machines. 5 pp. Hammond Machinery Builders, Inc., Kalamazoo. This illustrated folder gives information for improved finishing of tubes, rods, and bars of from ¼ to 9 inches outside diameter. It also describes the company's standard unit which can be either adapted to use with grinding, buffing, and polishing wheels, or arranged for contact-wheel and abrasive belts with Hammond's new back stand idler.

(804) Dies and Tooling

Die and Tool Makers. 12 pp. Barth Stamping and Machine Works, Cleveland. This booklet outlines the engineering services available through the Barth organization. In addition to information on tooling, engineering and manufacturing facilities, the catalog also contains two handy charts—one for allowances for various classes of fits, and the other showing the weight of round carbon steel bars one inch long and of varying diameters.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(805) Tapping Machine

Bakewell Tapping Machine No. 0. 8 pp. Bakewell Manufacturing Company, Los Angeles. This illustrated catalog describes the features, capacity, and specifications of Bakewell's No. 0 tapping machine. A comprehensive list of uses for the machine is included.

(806) Decimal Chart

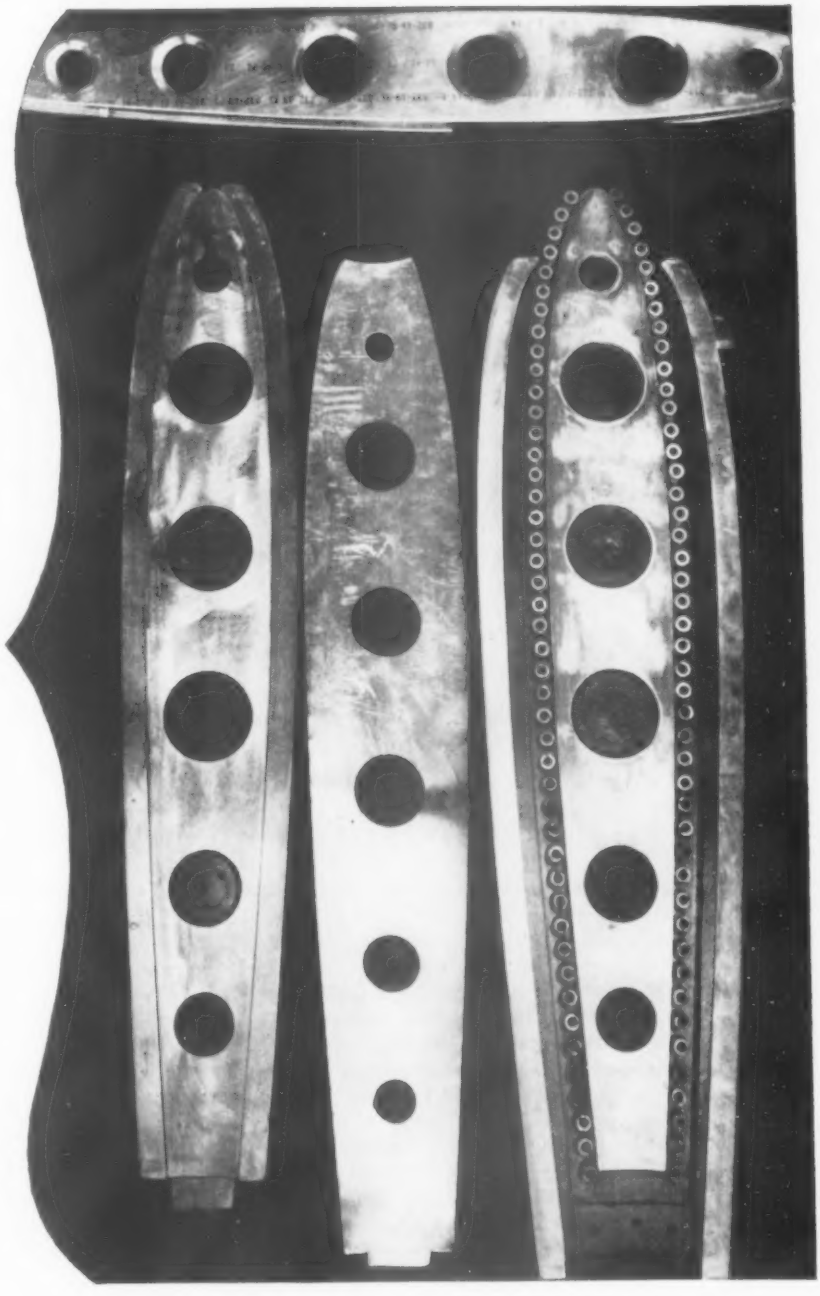
A new handy decimal chart has been offered by the United States Rubber Company for use by engineers and manufacturers. It shows at a glance the equivalent of fractions in four-point decimals.

(807) Reclaiming Cutters

GT-157. 6 pages. Carboloy Company.

(Continued on page 188)

SAVE TIME · MONEY · STEEL



This photo shows how Masonite Die Stock was used by Schlenzig Manufacturing Company, Philadelphia, to build a six-foot-long stabilizer rib mating die.

MANUFACTURERS all along America's wartime production front are saving time, money and steel by using Masonite Die Stock for special types of mating dies, forming blocks, templates, jigs and fixtures.

This amazing semi-plastic material has great compressive and flexural strength . . . stands up under present-day production requirements . . . can be fabricated in pattern or metal shops with great speed . . . saves manufacturers precious time in tooling up and getting into production.

Only one-sixth the weight of steel, Masonite Die Stock produces dies, forming blocks, jigs and fixtures that can be easily handled in and out of hydro press or power brakes, etc., by either men or women—hoists or cranes are seldom required. To conserve steel for the vital purposes of guns and ships—to do a faster job at lower cost—investigate this remarkably efficient and economical material today.

Masonite Die Stock is available in thicknesses of ¼ to 4 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For greater thicknesses, this material can be laminated with cold setting Urea-Formaldehyde glues. To learn more about Masonite Die Stock, please mail coupon below.

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Please send me illustrative literature and complete information about Masonite Die Stock.

Name and Firm _____

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Inc., Detroit. This bulletin gives detailed information on procedure for reclaiming carbide-tipped cutters and worn hss. cutters. It outlines how to utilize carbide tips which have broken or worn undersize, how to braze tips on multiple point cutters, and how to put carbide tips on cutting edges of hss. cutters. Also included in the book are instructions for sandwich brazing and for removing carbide tips from steel shanks, both silver and copper soldered.

(808) Metal Cleaning

Metal Cleaning Handbook. 72 pp. Magnus Chemical Co., Inc., Garwood, N. J. This booklet covers procedure and materials used in cleaning metal parts. The first half of the book contains information on four main classes of cleaning material—solvents, petroleum spirits, alkaline compounds, and emulsions—and discusses particular adaptations of each. The second section of the handbook deals with modern metal washing machines. All types of cleaners ranging from dipping tanks to automatic conveyors are discussed. Also included are tables, blueprints and charts.

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(809) Centerless Grinding

Principles of Centerless Grinding. 48 pp. Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio. This educational booklet has been revised to include new illustrations and latest information on centerless grinding. It discusses basic principles, operating controls and construction details, work blades, corrective adjustment, and other phases of centerless grinding. A new table of grinding wheel recommendations also is included.

(810) Machine Tool Control

What Is Duplimatic and How Does It Work? 16 pp. Detroit Universal Duplicator Company, Detroit. This illustrated folder pictures and discusses the Duplimatic full automatic control for putting intricate boring, turning, milling, shaping, and die-sinking operations on a production basis. Examples of uses for the machine are included.

(811) Flexible Hose

Titeflex Metal Flexible Hose. 36 pp. Titeflex Metal Hose Company, Newark, N. J. This new catalog describes the flexible metal hose made by the company for use in conveying oils, gases, and liquids. Pressure charts and other essential data are presented, together with information on application of the hose to machine tool and other uses.

(812) Whiteprints

Ozalid Whiteprints In The Shop. Ozalid Products Division, Johnson City, N. Y., has prepared a folder dealing with whiteprints in machine shop use where drawings are likely to become dirty or greasy. The folder discusses the company's method of providing maroon lines on a white background, which, it is claimed, stand up better than blue prints under adverse conditions.

(813) Electric Drills

The Portable Electric Drill. 16 pp. Black & Decker, Towson, Md. This handbook contains information on use and care of the small hand electric drill. Published principally for operators, it contains a cutaway section drawing of a drill and lists pointers on assembling the tool. Other aspects of drill operation discussed are grounding of the drill, motors and current, the switch, care of cable, chucks and bits, and lubrication.

(814) Standards

American Standards. 20 pp. American Standards Association, New York City. This new list of standards is designed as a handy reference for engineers and contains more than 600 items, many of which are new since the last edition was published in August, 1942. Standards are grouped according to subject and cover all important engineering fields. An alphabetical index also is provided for quick reference.

(815) Measurement

Lightwave Measurement. 12 pp. Ac-

(Continued on page 190)

- - and like commandos, given those jobs that require "the best!"

For those assignments where service conditions are known to be unusually severe, or where they carry the unknown "X-value" of stress that cannot be exactly figured, British Commandos and American Rangers are chosen in warfare. For those same assignments in war equipment, Ampco Metal is the usual choice of design or operating engineers.

This special bronze alloy, like those special shock troops, has established a splendid reputation for delivering more than is expected of it. For a combination of high strength, exceptional life through resistance to wear, high fatigue strength, and general all-around versatile performance, Ampco Metal is without equal in the bronze alloy field. It plays a part in the construction of most aircraft, heavy ordnance, heavy machinery and machine tools. Put Ampco Metal to service in your equipment where parts are failing, and gain the satisfaction of solving a difficult metal problem. . . . Ask for "File 41" — Engineering Data Sheets that give case histories and technical data. It's free.

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THE METAL WITHOUT AN EQUAL

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SNYDER

AUTOMATIC "SPECIAL" for milling binder bar slots in aircraft cylinder heads

★

This machine was developed for milling slots for binder bars angularly placed in three fin sections of forged aircraft cylinder heads.

The tool spindles are of high speed, precision, ball-bearing type, driven by V belts from individual, dynamically balanced spindle motors. Each spindle is controlled by an individual hydraulic cycle and all three are geared for simultaneous operation.

The tools are double-end, straight shank end mills with adjustment for cutterwear by means of micrometer screws.

The part is located on a master locating plate which is clamped on the fixture table manually. When the cycle starter button is pressed, the three tools advance into the work to the full depth of the cut.

At this point the table automatically moves forward and feeds the work against the cutters for the entire length of the cut. At the end of this cut, the table stops, the cutters retract and the cycle is complete.

When the next part is placed on the table, the operation is repeated. This time, the table automatically moves backward for the lengthwise cut, returning to its original position and thus eliminating the need for resetting the table after each cycle.

The fixture is hydraulically operated for the feed stroke and rides on hardened and ground ways with a heavy center guide. The three controls shown on the column control the cycle for the infeed of the tools and the forward and backward feed movement of the fixture table.

If your post-war planning calls for high production at low unit cost, we invite your inquiries as to what Snyder special and standard machines can do for you.

SNYDER
TOOL & ENGINEERING CO.
3400 E. Lafayette Ave. • Detroit 7

designers and builders of machinery for **HIGH** *production at* LOW *unit cost*

me Industrial Company, Chicago. This new booklet contains instructions for making use of light waves for shop measurements. Information is based on experience in Acme's own shop. By following directions given in the booklet, any mechanic can measure in millionths of an inch, according to the company.

(816) Boring Machine

445 Cylinder Boring Machine. W. F. & John Barnes, Rockford, Ill. This two-color folder illustrates and describes the company's cylinder boring machine. It includes a complete list of specifications.

(817) Hydraulic Machinery

Hydraulic Power Units and **Hydraulic Test Units.** 4 pp. each. Hydraulic Machinery, Inc., Detroit. The power unit section shows ten models adaptable for any motion desired on feed and traverse of multiple or single tools. The test unit section describes new models designed for checking hydraulics before and after assembly. The power unit may be used with new machines or may be adapted to changeover models.

(818) Maintenance Equipment

Martindale Equipment. 46 pp. Martindale Electric Company, Cleveland. This catalog contains a complete listing of the company's electrical servicing equipment as well as its line of files, burs, grinding wheels, and similar equipment. The book also contains a description of masks, small hand tools, wiring accessories, and wheel and gear pullers offered by the company.

(819) Personnel Training

Manpower Reports. 12 pp. Manpower Division, Automotive Council for War Production. This report outlines conclusions drawn from experience of members of the Council with supervisory and non-supervisory training. It also describes the types of training methods currently available and discusses how these have been applied in particular cases. The book also has a post-war slant in that it concludes training programs will be an essential phase of peacetime production.

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(820) Slotting Machine

Universal Slotmaster. 4 pp. Experimental Tool and Die Company, Detroit. This new catalog describes how this machine may be used to save tools and set-ups. It also contains a description of tooling for cutting internal gears, broaching splines, lapping deep impression dies, and similar operations.

(821) Photographic Copying

Make Your Own Photo Copies With Apeco. American Photocopy Equipment Company, Chicago. This two-color folder shows the features of the Apeco machine. It also describes the operation involved in making copies of letters, blueprints, photographs, and similar work.

(822) Carbide Tools

Standard Carbide Tools. 4 pp. New England Carbide Tool Company, Cambridge, Mass. This new catalog covers the dimensions, forms, and clearances of the company's four standard styles of right and left hand tools as well as its square and pointed tipped tools. A handy heavy cardboard wall chart showing this same information also is available.

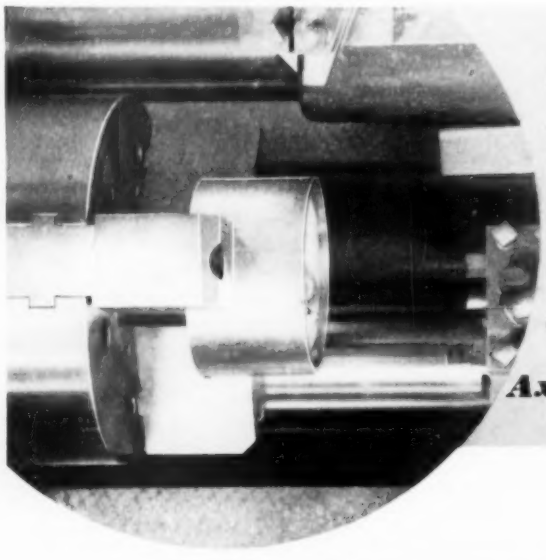
(823) Drilling

Deep Hole Drilling Machines. 4 pp. Morey Machinery Co., Inc., New York City. This circular, just off the press, describes the Morey Deep Hole Drilling Machine. In addition to describing the various models available, it also contains a floor plan for installation of the machine.

(824) Steel

Firth Sterling Steel Company, McKeesport, Pa., has issued a set of booklets dealing with the various types of steel supplied by the company. Titles are: **Sterling Stainless Steels—Type A and B; Sterling Stainless Steels—Type T and FC; Sterling 18-8 Steels,** and **HWD Hot Work Die Steel.** These booklets, 4 pages each, are conveniently punched for insertion in a three-ring binder.

(Concluded on page 192)



Every time
you close
these jaws
our grip on the
Axis grows tighter

● Every gun . . . every tank . . . every plane . . . every rifle and truck, bombsight and bomb, ship and torpedo . . . that goes out of America's arsenals to speed our victory, very largely consists of parts that were formed in the jaws of chucks. No piece of production equipment is more directly engaged in the "front line battle". Therefore we say to Cushman Chuck users . . . get the last ounce of efficient productive effort out of your chucking equipment. Let us help you make sure that the correct types are used to handle each job most efficiently. Make sure that your operators follow simple maintenance rules that prolong chuck life and assure accuracy. Help us speed your deliveries of needed new chucks by correct specifications in ordering, by anticipating your needs as far in advance as possible and by furnishing suitable priorities. We will be glad to send you copies of the Cushman Catalog and Data Book, also supplies of "Chuck Check" maintenance cards on request. The Cushman Chuck Company, Hartford, Conn.

These small "Chuck Check" maintenance cards can be given to operators or put on bulletin boards. They'll help save time, save chucks and reduce spoilage. Ask us to send you some.

CUSHMAN

A World Standard for PRECISION

Aluminum Alloy Pistons...

Finished "True Round" At 1500 Surface Feet per Minute

★ Finish-turning aluminum alloy pistons to a smooth, "true round" is a delicate job at any speed. At 1500 surface feet per minute it's a major accomplishment . . . made possible by the rock-like rigidity of the Lipe Carbo-Matic Lathe, and by the smoothly-flowing power of its enveloping cone-worm gearing. Gearing so perfectly cut and matched that 60 weeks of three-shift operation has produced no trace of wear or backlash . . . no deterioration in finish or deviation from the close limits required!

★ Carbo-Matic is a high-speed, fully-automatic lathe designed for battery operation by one operator. Hydraulic holding equipment, feeds, tailstock quill. Swing over bed 15", over carriage 8". Between centers 30".

LIPE-Rollway Corporation, Syracuse, N. Y.

LIPE *Carbo-Matic* LATHE

(825) Gaging
Handbook of Precision Measurement. 64 pp. Jansson Gage Company, Detroit.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

Free to executives requesting it on firm letterheads, this book is offered to other individuals for 50 cents. It contains five chapters of information on measurement, together with photographs of actual operation. Precision measurement, gage block combinations, angle measurement with the sine bar, and use of vernier calipers and height gages are discussed. A catalog section of Jansson inspection products also is included.

(826) Tool Handling
Tool Conservation. 17 pp. Greenfield Tap and Die Corporation, Greenfield, Mass. Dedicated to the premise that real tool conservation begins in the tool crib, this book deals with specific features of crib management.

It discusses planning, location, and layout of the crib, identification of tools in the bins, a tool crib accounting system, economical utilization of space, the crib window, and types of bins.

NEW BOOKS

Mathematics for Machinists by R. W. Burnham 253 pp. $2.00. John Wiley & Sons, Inc., New York. This new revised edition is slanted to the untrained worker as well as to the more advanced machinist. It aims to present machine shop calculations in a simple manner and to accompany them with sufficient explanation of the operation concerned so that the machinist can understand them, according to the publisher.

Subject matter discussed in the book includes decimal and common fractions, percentage, blueprints, measurements, powers, square root, lathe work, threads, thread cutting, principles of simple machines, gear calculations, volume and weight, shop trigonometry, and materials and processes. Also included is an appendix containing formulas, decimal equivalents, emery wheel speeds, temper colors and similar material.

Mechanical Movements. 256 pp. Edited by W. M. Clark and published by Garden City Publishing Company. $1.98. An entirely new book, this publication brings together a fund of basic information on fundamental principles for transmitting and controlling movement.

Profusely illustrated, the book is readable to any person with a reasonable grasp of mechanical terms. Material treated graduates from the more simple pulleys and gears to involved transmission principles and intricate constructions. Examples of subjects discussed are: gears and drives, bearings, velocity and force, change of direction of movement, timing and regulation, special types of movement—such as reciprocating, variable, alternating, parallel, and oscillatory—hydrostatic devices, gages, and gyroscopes.

THE END

Navy Repair Men Turn a Neat Trick in Rodless Welding

That American resourcefulness has no geographical frontiers is illustrated by this letter received by the Hobart Arc Welding News from a Navy shipfitter in the South Pacific:

"Out here on the other side of the world where replacement parts are next to impossible to get, we appreciate our gas engine driven arc welders. We find plenty of jobs that we would consider impossible back in the States, but somehow we discover a way of repairing a broken or worn piece of equipment and soon it is ready for duty again.

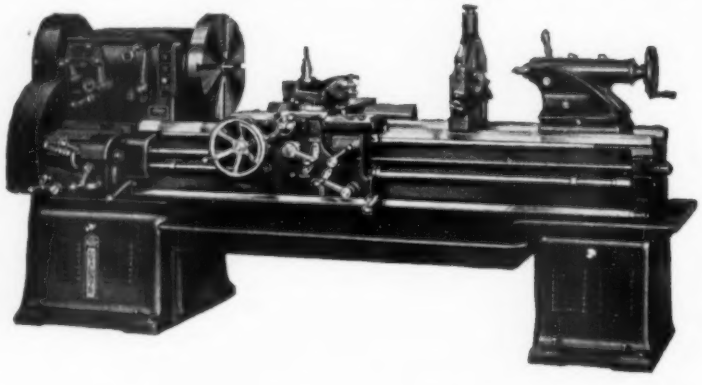
"While on a repair trip through the jungle, we were called on to rebuild five teeth that had been sheared off a small gear on a commutator shaft. We discovered we didn't have any welding rods, so I set the machine in reverse polarity and used bare steel rods to build up the teeth. As these were too soft to last long, we dressed them with a file and welded a small bead of Stellite on the surface. Believe it or not, it works perfectly and the entire job was finished in three hours." THE END

All the fine-quality engineering of

A TOP-NOTCH LATHE

at your command in

THE METALMASTER



★ Low production costs, smooth operation, continuous accuracy are assured because The Metalmaster's design is highly efficient, and its construction sturdy and precise.

★ For example, 12 speeds in both forward and reverse directions, and precision-made spindles insure perfect running balance.

★ The speeds are in geometrical ratio; a direct reading index plate indicates lever positions for all speeds.

★ The spindles are high carbon molybdenum steel forgings, bored from the solid stock straight through from end to end and the gears, which are high quality alloy heat-treated steel, shaved and lapped to close tolerances.

Write us for all the facts about this super-quality lathe.

1840 - 1943

Bradford's experience in building metal-working machinery covers more than a century

ALSO MANUFACTURERS OF DRILLING AND TAPPING EQUIPMENT

THE BRADFORD MACHINE TOOL CO.
EVANS STREET SOUTH OF EIGHTH, CINCINNATI, OHIO
PRECISION TOOLS SINCE 1840

BELIEVE IT OR NOT, GENTLEMEN WE CAN MAKE ALL DELIVERIES ON TIME!

IT CERTAINLY PAYS TO INSTALL

TURNER UNI-DRIVE

Motorizes Machine Tools

These Features are Responsible:

- **No belts to shift—Drives to large step of cone at all speeds**
- **Eliminates overhead line and counter shafts**
- **All advantages of geared head with belt drive smoothness**

The high-speed, volume-production methods of wartime call for modern machines, modern methods. More speed ... greater production ... you must have them to keep apace! Enlist the aid of TURNER UNI-DRIVES. They'll increase production like an extra shift ... save time ... speed up work ... keep down power costs. They're doing it in scores of shops and plants. They'll do it in yours. TURNER UNI-DRIVE is the *successful* one motor drive.

Easily and quickly installed. They do away with overhead counter shafts ... no belts to shift. Increase the efficiency of machine and operator. One trial will thoroughly convince you.

Right now ... today ... investigate TURNER UNI-DRIVE. See your dealer, or write or wire us for full information.

NOW AT WORK FOR VICTORY ★★★

IT DOES THE JOB on Lathes, Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools. Also for Browne & Sharpe and Cleveland Automatic Screw Machines.

THE TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace Street, Kansas City, Mo.

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

TOOL DESIGN TRAINING

E. A. DOOGAN

CHIEF TOOL DESIGNER, ST. LOUIS PLANT
AIRPLANE DIVISION, CURTISS-WRIGHT CORP.

BEFORE Pearl Harbor the Curtiss-Wright Corporation anticipated a wartime shortage of tool designers, and with the cooperation of the U. S. Office of Education, Federal Security Agency, started a tool design training school.

Today, more than one-third of the tool designers in the corporation's St. Louis Airplane Division have completed this course of 24 weekly lessons.

The two-hour class consists of a lecture illustrated with talkie movies and blackboard, and a question and answer period, with each lecture devoted to a specific topic, such as a certain type of tool, a drill jig, a mill fixture, or construction of a tool.

Two classes are held weekly, one in the plant and the other at Washington University, St. Louis. Average enrollment in each is about 60.

Curtiss-Wright photo

Instructor Doogan illustrates a point.

These free classes are open to anyone interested in tool design, or others who wish to broaden their knowledge of tools so they will have a better understanding of the tools they use on their jobs. A record of class work is kept at the university for reference by prospective employers.

Enrollees must have a high school education. Their work background is not important, but interest and aptitude is. My experience is that younger men pick up the fundamentals of tool designing more quickly than older men. However, some older men have been found suitable for doing specific jobs.

One graduate formerly operated a beer bottling machine in a brewery; another was a carpenter-contractor. Both are doing well as tool designers. Yet some men who were good tool makers when given an opportunity to become tool designers, were utter failures.

SUBJECTS OF THE LECTURES

The lectures begin with a talk on sequence of operations. It is explained as the "road map" in the plant. Lectures follow on drill jigs—plate, box, index and pump types, and locators and clamps. Then come lectures on milling machine vise jaws and milling machine fixtures — horizontal, vertical, index type, and locators and clamps. The last one of the 12 lectures in the first series is on types of tool construction—cast iron, welded, and screws and dowels.

The second series of 12 lectures is on turret lathe tooling, fixtures and chuck jaws; welding fixtures—gas and spot welding; automatic screw machines—tools and cams; four lectures on punch and dies—blanking, progressive, forming and drawing; and a final lecture on standards in tool design and general instructions for correct design of tools.

"Talkies" from the Federal Security Agency are shown at each lecture. A film appropriate to the subject of the lecture is used.

Students do no drawing board work. However, enrollees are encouraged to design a tool during their spare time.

During classes, a stenotypist takes notes on everything and from these the instructor makes up a resume, including free hand drawings. In pamphlet form of three to 12 sheets, these are distributed to students in place of a text book.

Textbooks have little on basic fundamentals. They are full of clever ideas which may never be used again. It is my contention that the fundamental principles of tool designing are not explained thoroughly in any textbook. However, all books on tool designing are worthwhile for the man who already has acquired the basic principles.

(Concluded on page 198)

DETROIT
DIE SETS ★
SEMI-STEEL
and ALL-STEEL
STANDARD DIE SETS
SPECIAL DIE SETS
PRECISION DIE SETS
DOWEL PINS
SPRINGS
ACCESSORIES
SPECIAL SERVICE
ON SPECIAL DIE SETS . . .
We are especially well equipped to make special die sets to your specifications and we make a sincere effort to give you the fastest delivery service that today's conditions permit.
For prompt action, send us your prints and instructions.
STEEL PLATE—fabricated or torch cut to size or to your template.
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Sales and Service Offices in—NEW YORK • PHILADELPHIA
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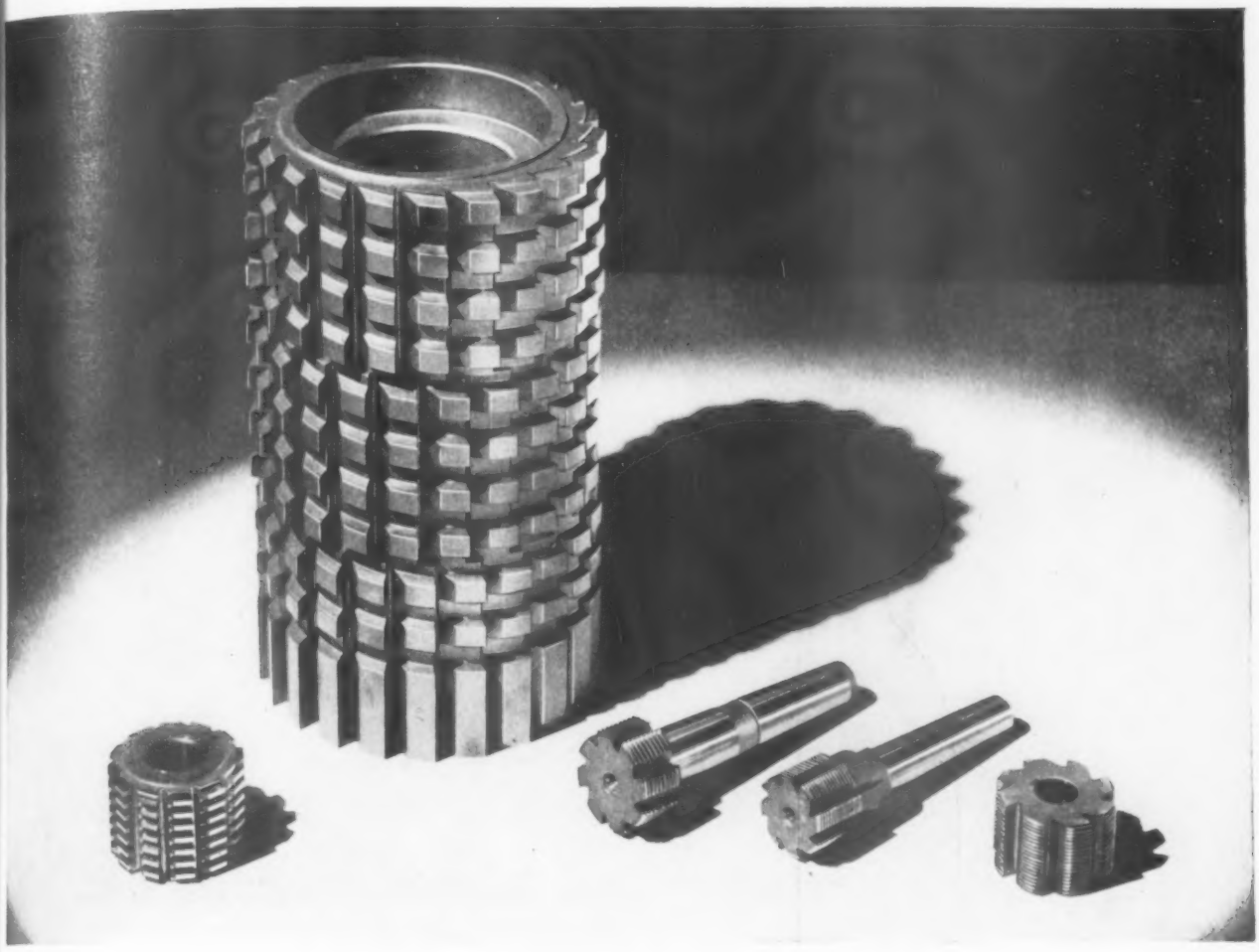
PLAN-O-MILL



THREAD MILLING CUTTERS

Years of on-the-job experience—working with production men all over the country as each Plan-O-Mill milling machine was tooled for another job—told Plan-O-Mill engineers exactly what was needed for accurate, economical thread milling.

The result is the Plan-O-Mill Multiple Thread Milling Cutter, now proving its worth in factories and machine shops from coast to coast.

Plan-O-Mill Thread milling cutters are available ground or unground with straight or spiral flutes, in National, Whitworth, Acme, V, and special forms, for use on all types of thread milling machines. For speedy delivery give full details when ordering, including size of cutter; thread form, pitch, and direction; straight or spiral gash, and job description.

MILLING MACHINES

PLAN-O-MILL

MILLING CUTTERS

PLAN-O-MILL CORPORATION, 1511 E. Eight Mile Road, Hazel Park, Mich.

HANDY ANDY *Says*—

T.M. REG. U.S. PAT. OFF.

AS ONE of a capacity audience at Detroit Chapter's June meeting, I was privileged to listen to a leader in contemporary thought, Col. H. W. Miller, University of Michigan.

He had things to say, and said them exceedingly well. And, I agree with most of his views—as government by engineers, among other things—and will ride along on the train of thought started by his comments.

Of particular interest to me, since it supported my own conclusions, was the intimation that world population has reached the saturation point.

Due to soil erosion and other causes, the world's arable land is now inadequate to feed its two billion inhabitants. And, largely, that is what people are fighting about, in the vast arena of global war as well as in blighted areas and in the alleys of city slums. They want to eat, and they want breathing space—or, as Hitler puts it, "liebensraum."

▲ ▲ ▲

Be all that as it may, it is significant that the aggressors in this war—Italy, Germany, Japan—were each over-populated and in economic straits. Yet, paradoxically, they were not too poor to start wars the cost of which, if diverted to reform instead of mass slaughter, would have resolved the world's economic problems for ages to come.

Oddly, too, their immediate demands for "liebensraum" were made on neighbors who, with a few exceptions, had barely enough for their own existence. Of course, the ultimate objectives were the lusher lands beyond the fringes of poverty, yet, what benefit their acquisition if propagation went on unchecked? A few years in which to recuperate, the while contenders vied in a race for numerical superiority, then the population problem more acute than ever, the final, titanic contest for racial dominance!

▲ ▲ ▲

Now, the logical procedure is to effect a balance, either through wholesale decimation or, as a happier way, through scientific birth control. Unfortunately, that alternative to war, pestilence and famine—the "natural" balance favored by orthodox moralists—has been contested on moral grounds when, as a matter of fact, the issue is essentially economic.

Once, when broad horizons invited the pioneer, propagation was not only an economic but a moral necessity. That time is past. Today, no nation, nor any minority within a nation, can breed beyond a capacity for decent living without becoming a focal point for world unrest. Over-population, then, has become a social crime to be compounded rather than expiated through war.

Yet, the tragic thing is that untold millions have had to die miserably, and that other millions have been born to live miserably, largely because the approach to scientific control of population has been blocked by an archaic moral precept. The weapon against that barrier is liberal education.

▲ ▲ ▲

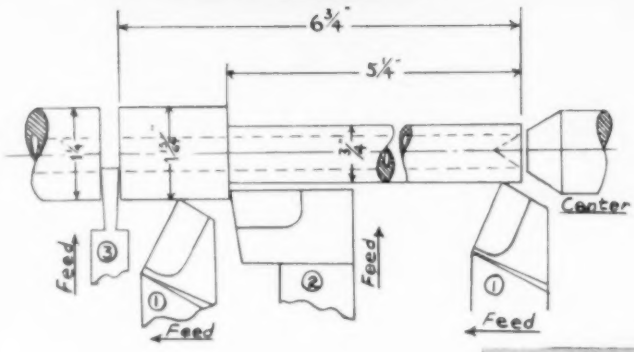
What I can't agree with is the idea that neutrals should be punished because, as I inferred, they are not at war on the side of the Allies.

Should we, then, punish Turkey because, while a formidable adversary in World War I, she now refuses to side against us? Or friendly Switzerland when, if that little state were to declare war on an encircling Axis, it would portend national extinction?

Let's be reasonable! What justice in appeasing states—which are frankly pro-Fascist—as the Franco government of Spain—while at the same time planning reprisals against neutrals as overtly pro-Ally? But then, let the spokesmen for those lands plead their causes; as for me, I'll state the case for Sweden. Not, however, because of my nativity, but as an American who believes in fair play.

(Concluded on page 198)

KENNAMETAL*
Outproduces Other Carbides in Cutting *Stainless Steel*



• KENNAMETAL again gives the top steel-cutting performance on a tough job!
In an actual shop run KENNAMETAL turned 12 pieces of stainless steel tubing at 920 rpm and 2 more pieces at 1480 rpm in comparison with 8 to 10 pieces per grind by competing carbides. Only with KENNAMETAL was this job machined without appreciable loss of size.
The material was 18-8 stainless steel tubing (2.5 manganese). The operation employed feeds of—tool No. (1) .010"/Rev., tool No. (2) hand feed, tool No. (3) .004"/Rev. The tools that were used in this operation are illustrated.
For boring, turning, and facing to close tolerances use KENNAMETAL steel-cutting carbide tools.
Write for your copy of the KENNAMETAL Tool Manual. It contains information on the handling and proper use of steel-cutting carbide tools.

KENNAMETAL Inc.
600 Lloyd Ave., Latrobe, Pa.
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KENNAMETAL THE All American CARBIDE

HOME-BASE YOUR PLATING PROBLEMS AT HARTFORD CHROME

Check with Hartford Chrome if you want an up-to-date picture of the progress made in hard chrome plating. Yesterday's tough problems are ordinary production jobs here. We've developed the successful application of hard chrome plating to include an endless list of molds, dies, gauges and other tools and parts. Result is that leading Eastern manufacturers home-base their plating problems here. You can connect in Connecticut too, by calling on Hartford Chrome to expedite your work.

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Up-to-date helpful information—reprints of "Know-How" plating articles from leading trade publications.

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Licensed By United Chromium

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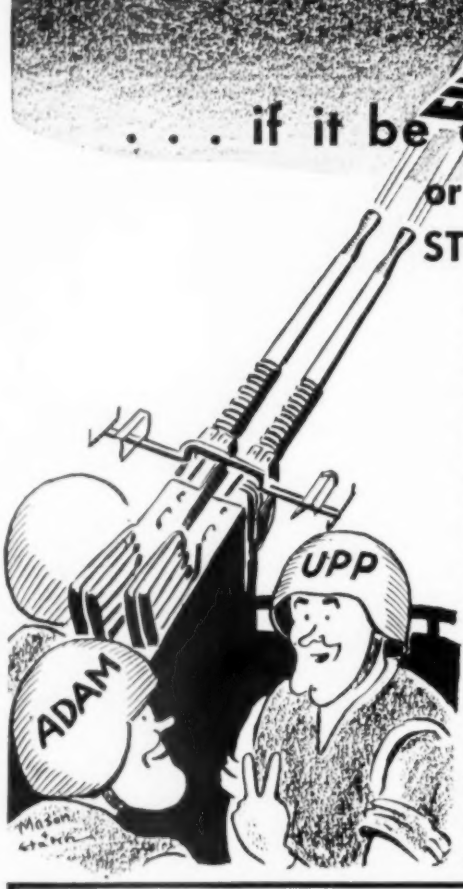
Zero

means exactly nothing . . .

. . . if it be a Jap plane

or the wrong TOOL

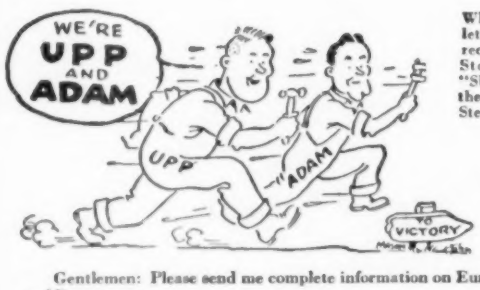
STEEL welding rod



You can accomplish zero, without using the right welding material and correct engineering for tool and die welding. We are able to furnish both the proper electric arc or oxyacetylene tool steel welding wires plus specialized engineering direction. The Eureka tool steel welding wire line is the only answer. Eureka tool steel rods are obtainable for oil hardening, air hardening, water hardening, hot working tool steels or alloy purposes. They can be utilized by your own welders for maintenance repair of your present dies or for composite construction of new dies by applying proper tool steel welding rods as cutting edges on ordinary carbon steel (in most cases without subsequent heat treatment). Or you may send your broken high speed cutting tools to our plant for reclamation by the "SUTTONIZING" principle.

WELDING EQUIPMENT & SUPPLY COMPANY

222 LEIB ST., DETROIT, MICHIGAN



Why not be Upp and Adam too—by letting us outline your tool and die reclamation program with Eureka Tool Steel Welding Electrodes; and the "SUTTONIZING" welding process for the reclamation of broken High Speed Steel Cutting Tools?

WELDING EQUIPMENT & SUPPLY COMPANY
222 Leib Street
Detroit, Michigan

Gentlemen: Please send me complete information on Eureka Electrodes and the "Suttonizing" welding process.

Name.....Title.....

Company.....

Address.....

City.....State.....

—HANDY ANDY SAYS—

(Concluded from page 196)

At the outbreak of war Sweden was caught in the middle between vastly superior forces, Russia and Germany. "Scrap of paper" though it proved to be, the Hitler-Stalin pact still hung like a Damoclean sword over minorities. And Sweden had not only strained her resources in aiding Finland, but her relations with Russia as well.

Furthermore, she had alienated the Axis because of her protests in behalf of Ethiopia and Loyalist Spain and because of criticism of the Nazi regime.

In turn, she had been sharply criticised by the western democracies because of the refusal to permit passage of British and French troops to Finland, a stand now acclaimed by the British as cold blooded wisdom. Had that passage been sanctioned, it is an open question if Russia would now be aligned on our side.

▲ ▲ ▲

She was further criticised for not helping Norway during the invasion, and latterly for permitting passage of unarmed Nazi troops from Norway to Germany. Well, that's an interesting story in itself, to be told later. Right now, I haven't the space.

On the credit side of the ledger, however, Sweden has been a safe haven, not only for escaping Norwegians, but for refugees from other occupied lands. And, exclusive of Norway and Finland, she has contributed more than 200 million kronor (more than 50 million dollars) for relief work in foreign lands—a lot of money for 6,250,000 people. She is helping feed Belgians, Poles, Greeks and others, out of all proportion to resources.

While tightening her own belt, she has temporarily adopted some 40,000 Finnish children who otherwise faced starvation. They come, so starved that food brings on wracking nausea; they go back sleek and fat. She has fed over 14,000 Norwegian children, at least all that the Quisling government has permitted to be moved into Sweden.

To all peoples, regardless of race, creed or color, she has been the friend in need. And, as she has done for the least of these, so she has done for the cause of humanity. Should we punish her for that? THE END.

TOOL DESIGN TRAINING

(Concluded from page 194)

In these classes emphasis is placed on the fact that a tool is nothing but a holding device. I attempt to illustrate this by holding a piece of metal in one hand and a file in the other, and trying to file this piece of metal. Clamping the piece of metal in a vise illustrates that a tool is really a holding means and that the tool should be designed to withstand all cutting pressures.

Another fundamental in the lectures is that all metal cutting is done either in a straight line or circular motion, or a combination of them. The drill press is an example.

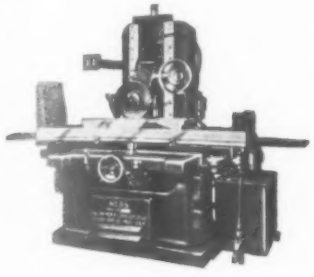
Enrollees soon deduce that tool design basic principles are easily learned but that tool designing is never completely learned, because every job requires a new knowledge. Materials and machine tools are ever changing, necessitating changes in designs of tools, but never very much in the fundamental principles.

THE END

SPEED & PRECISION

with

Grand Rapids Hydraulic Feed Surface Grinders



While keeping pace with the Defense Program Grand Rapids Grinders are maintaining the features that have made them one of the leading machine tools of the Nation.

One piece base and column insure accuracy at high speeds attainable on all Grand Rapids Grinders.

Write for Catalog GL-100

GALLMEYER & LIVINGSTON CO.

110 Straight Ave., S. W.

GRAND RAPIDS MICHIGAN

DIAMONDS for Victory

for Victory

Special $25.00 Complete

"ANGLE-SET-MAGNET-BLOCK"

For Magnetic Chuck Grinding. Keep Surface Grinder Wheels in good order. A boon to tool and die makers. Suitable for wheels up to 8" dia. Larger diamonds can be used for larger wheels. Comprises three units: Block — 2½x3x1, 12° "Angle-Set" and BIG-HED-NIB with No. 10-CNX Diamond. Two LOC-KEY-SET Screws. Arrow indicates wheel direction.

Write for No. 3 Catalog illustrating most complete and up-to-the-minute line of Diamond Tools.

RE-SET-ABLE LOC-KEY-SET Re-setting $1.0(each tool. Mailing envelopes Free to Victory Plants. Grinders' instruction card free.

DIAMOND TOOL COMPANY, Not Inc.
Sheldon M. Booth, Pres.
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WELDON

REMINDERS

Diameter of End Mill	Tool Steel 70 ft. per Min. R. P. M.	Machine Steel 80 ft. per Min. R. P. M.	Cast Iron 90 ft. per Min. R. P. M.
1/16"	4276	4888	5498
3/32"	2855	3259	3688
1/8"	2140	2440	2750
3/16"	1420	1625	1830
1/4"	1070	1222	1375
5/16"	856	978	1100
3/8"	713	815	917
7/16"	611	698	786
1/2"	535	611	688
9/16"	475	543	611
5/8"	428	489	550
11/16"	389	444	500
3/4"	357	407	458
13/16"	332	379	427
7/8"	306	349	393
15/16"	285	326	366
1"	267	306	344
1 1/8"	238	272	306
1 1/4"	214	244	275
1 3/8"	194	222	250
1 1/2"	178	204	229
1 5/8"	165	188	212
1 3/4"	153	175	196
1 7/8"	143	163	184
2"	134	153	172

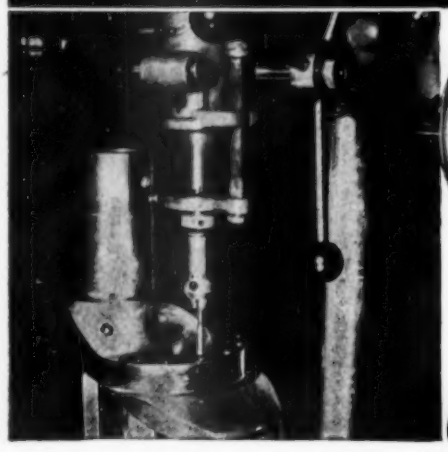
● **For Shop and Instructional Use the above Data is Available as a Two-Color Wall Chart.**

Send for your copy today

THE WELDON TOOL CO. *Cleveland, Ohio*

3000 WOODHILL ROAD

"HARDSTEEL" DRILLS



Save 6 Hours Time

. . . Removing Broken Tap from Wright Crankshaft!

In the plant of one manufacturer of Wright crankshafts, "HARDSTEEL" drills are saving time and giving 100% parts recovery when taps break in blind holes.

FORMER PRACTICE

Grinding out tap with pencil grinder—time 8 to 8½ hours—frequent loss of the part when grinder defaced threads.

PRESENT PRACTICE

Drill about ⅛ inch into tap with a "HARDSTEEL" drill—enlarge hole by grinding—drill again—grind and continue until tap is cut out. Time 2 to 2½ hours—no loss of parts.

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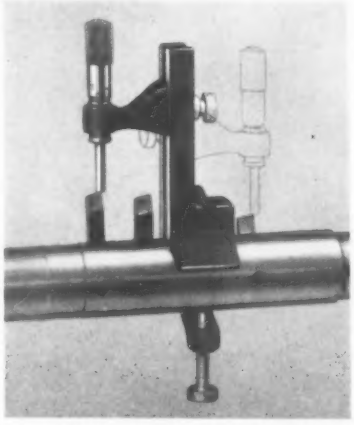

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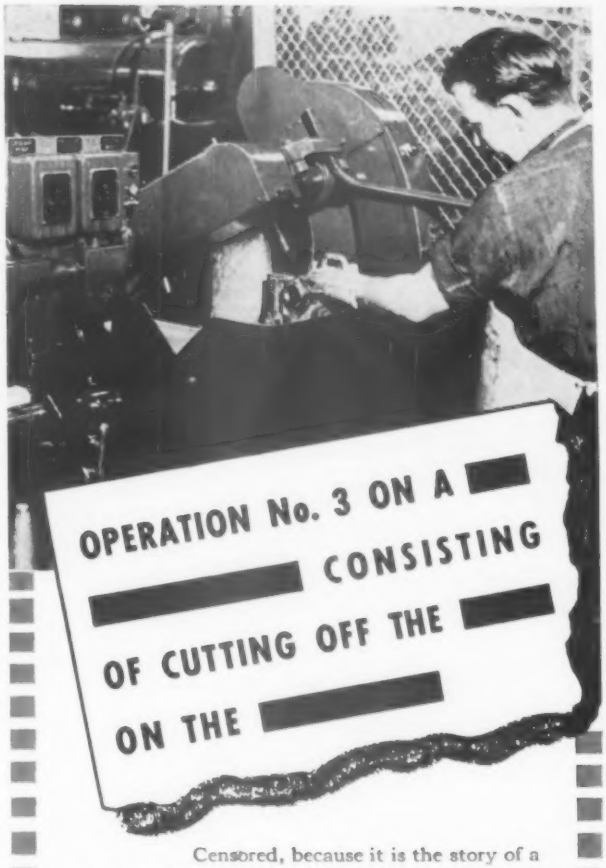

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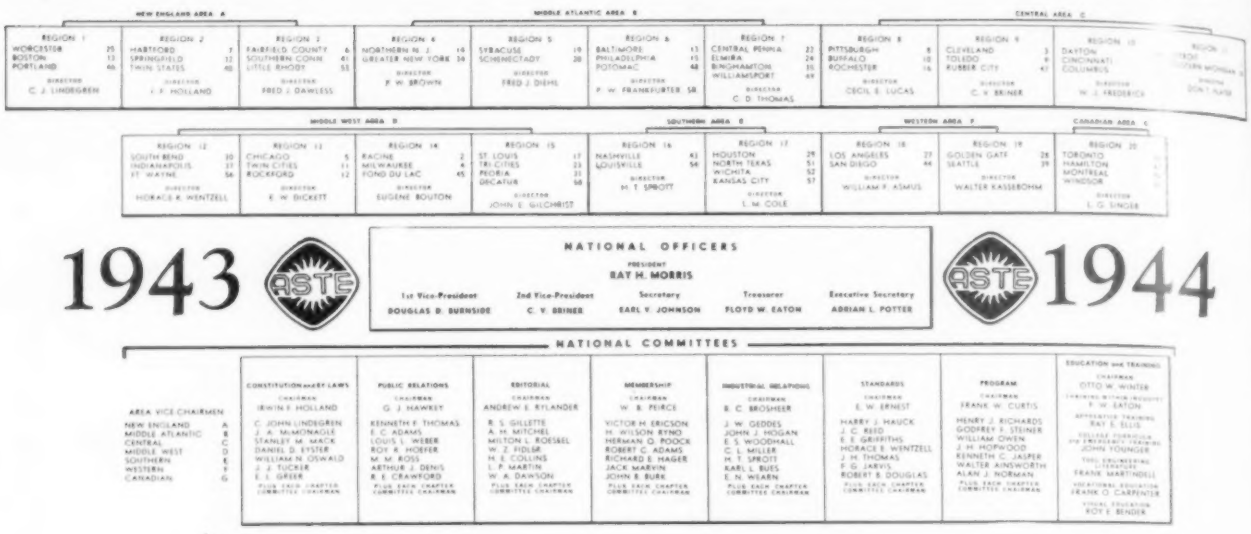

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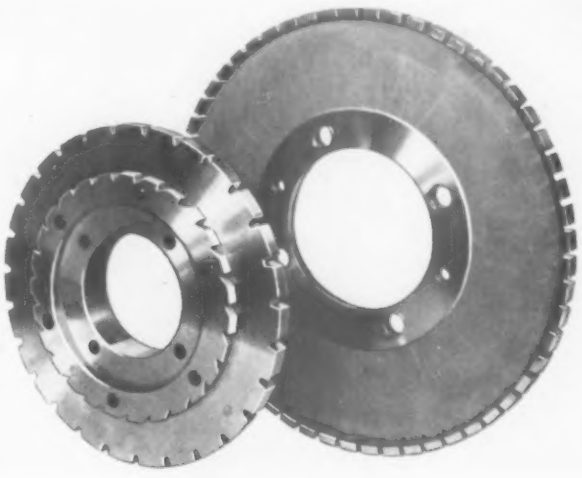

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PIECE-PART CONTROL; applicable on many jobs, makes tapping practically automatic. Placing the part in the fixture actuates a micro-switch and—*air does the rest.*

Tapping the Haskins way is faster, definitely more accurate, definitely less costly. Send for TAPPING TIPS—new literature that gives many money-saving, money-making ideas. R. G. Haskins Company, 2756 W. Flournoy Street, Chicago.

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COPPER HEAD LAPS

A practical method for lapping holes accurately and economically. Lapping action is rapid; abrasive compound works into the copper sleeve providing a medium that laps with speed.

Copper Sleeve, the only part that wears, is quickly renewable when worn. This affords real economy.

Sizes—1/8" to 2 1/2"

NOTE:—A Lap Consists of an Arbor and a Copper Sleeve. When ordering, please be sure to state if complete Laps or Sleeves only are wanted.

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DEALERS
An attractive proposition open in certain territories

Assures highest accuracy for rough, semi-finish and finish grinding of Tungsten Carbide tipped tools. Its sturdy construction insures a large volume of work on a production basis.
Uses 8" vitrified wheel for rough and semi-finish, and 6" diamond wheel for finishing.
Cool Cutting is assured by a steady flow of coolant, force fed by an electrically driven pump.

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THE popularity of Stuart's "Super-Kool" Honing Oils has increased in proportion to the rapid rise of honing operations. "Super-Kool" uniformity and quality insures better honing . . . proved advantages and quick availability rule out any necessity for hit-or-miss, homemade "mix-moxes". Try "Super-Kool" Honing Oils on your honing operations. A Stuart engineer will be glad to help you properly apply them. Ask him to call.

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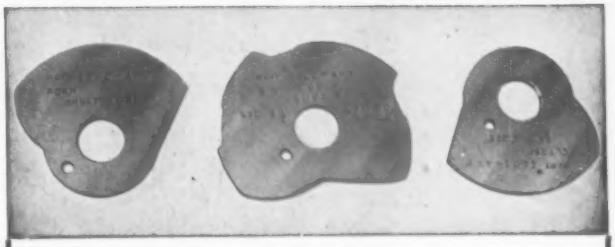

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B & S MACHINES

Cams cut to your layout shipped within 2 to 3 days.

Set of 3 No. 00 Cams including blanks, cutting, heat treating — $6.20 complete. Other sizes in proportion.

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Taperlock Plastic
GAGE HANDLES

LIGHT WEIGHT PLASTIC HANDLES give gages more sensitive touch because they are lighter than any metal. They reduce fatigue and insulate gages from bodily heat, safeguarding accuracy.

EASILY MARKED for identification with the same stamps used for marking metal handles.

LOW COST represents a real saving.

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. . . TIPPED WITH TUNGSTEN CARBIDE
Assure Greater Production and Accuracy in the finish grinding of bullet cores, armor-piercing shot, shells, projectiles, tank parts, aircraft engine parts, rifle and machine gun parts.
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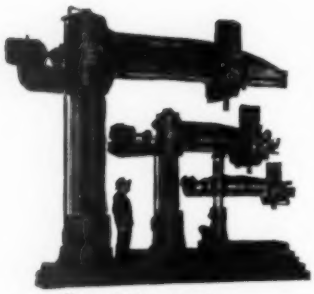

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C/R MALLETS AND HAMMERS

permit forceful effective blows without battering, scarring or marring. They protect fine finishes, delicate insulation, hardened parts and costly machinery. They far outlast other mallets, hold a true striking face and, because they absorb recoil, they are less fatiguing on continuous use operations (as pounding in winding, assembly work, etc.). Speed production—reduce spoilage. All sizes. Weighted or unweighted. Hammers take replaceable insert faces.

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USED FOR FINAL FINISHING OPERATIONS

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Built to meet the requirements of those desiring a heavily constructed, smooth running machine of highest quality.

Has motor in base with variable speed control, using REEVES standard pulley and belt.

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12" x 36"
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PERMANENT MAGNET TYPE CHUCK

Helps boost production rate of large pieces—or large quantities of duplicate parts.
No wires — no heating — no operating costs.
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SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

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NEW MODEL

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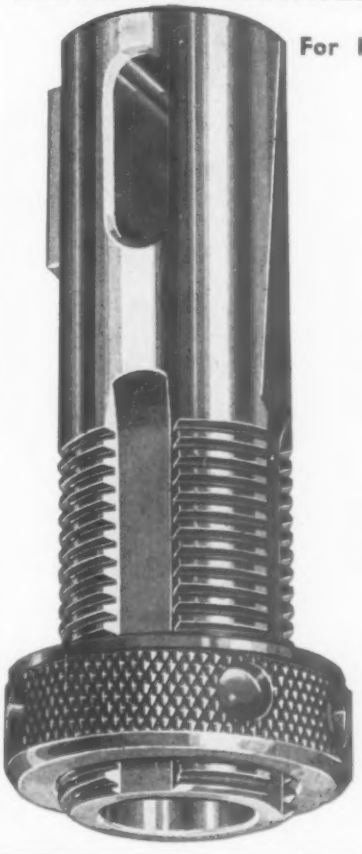

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STANDARD EQUIPMENT FOR ALL DRILLING REAMING AND TAPPING MACHINES.

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Utility tools

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A. S. T. E. DOINGS

Boston: More than 150 members turned out for the talk on "The Development of Precision Thread Grinding" by A. Bradford Reed at the meeting held June 10 at Schrafft's Restaurant. Mr. Reed is president of the Rolled Thread Die Company.

Guests included Jack Crawford, associated with the Simonds Saw Company, and Dan Stiles and Mr. Stickney of the Waltham Screw Company.

Dayton: Approximately 150 members turned out for the July meeting, an outdoor chicken fry held July 12. Following the dinner, several films were shown, including a technical production depicting the Army's aerial cameras and the function of the automatic pilot.

Hartford: Program plans for the coming year were discussed at the June meeting at the City Club in Hartford.

It was proposed that a report on rejected applications be requested from the national office in Detroit and permission be asked to notify local rejected applicants. Action on the proposal was set over to the next general meeting.

Also deferred for action at the next session was the motion to set aside a percentage of the chapter's funds for purchase of war bonds. A recent financial report shows the chapter treasury to have a reserve of more than $1,000.

Kansas City: G. G. Greulich of Carnegie Illinois Steel Corporation spoke on steel mats for use on emergency airplane landing fields at the July 7 meeting of the chapter. Packing of military supplies also was discussed by Walter Smith, representing the Butler Manufacturing Company.

Following the talks, members of the chapter held an open forum on pertinent problems in industry.

It also was announced that W. H. Lebe, chapter secretary, has joined the Navy as an ensign. George W. Hodes was elected to succeed Mr. Lebe.

Los Angeles: Principal speaker at the July meeting was Cecil W. Armstrong, Research Engineering Department, Lockheed Aircraft Corporation. He spoke on the physical properties of structural plastic material. He presented details and comparisons of tables showing how plastics compare with 24 ST aluminum and similar materials.

Included among moving pictures shown at the meeting were the Warner & Swasey film, "Chips"; a technical picture on welding; and a film on fire prevention. About 200 persons attended the meeting.

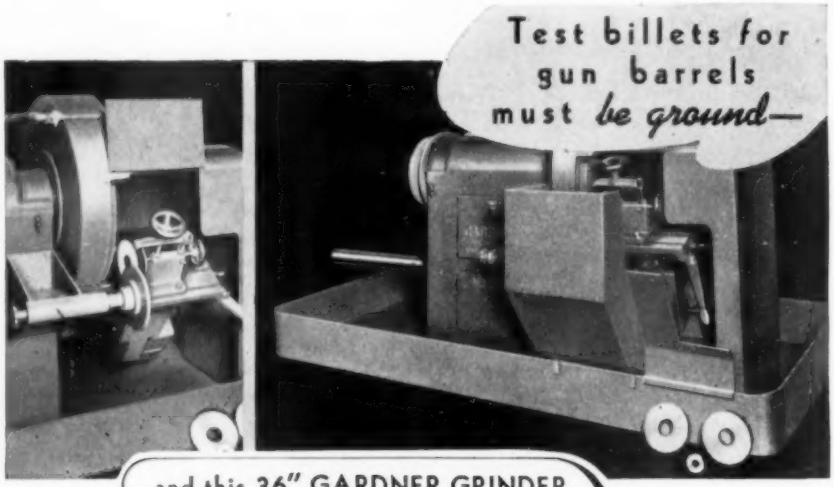
Portland: The Portsmouth Navy Yard was host to the Portland chapter at its meeting held May 21 at the Rockingham Hotel. Principal speakers of the meeting were two naval officers, Commander Munson and Captain Strachey, who told of their experiences in the Southwest Pacific theatre of the war.

The meeting was primarily a membership drive for the Portland chapter. Attendance was large, with several ASTE guests from the Boston chapter present. R. A. Goldsmith, chapter chairman and master machinist at the Portsmouth Navy Yard, was in charge of the meeting.

Rockford: New committee chairmen were announced at the chapter meeting held May 6 at the Hotel Faust. These included:

Meeting, H. A. Nelson; industrial relations, Glen Jensen; entertainment,

(Continued on page 210)



and this 36" GARDNER GRINDER does it—*efficiently!*

The circular pieces at the bottom of the above illustrations are test slugs, or billets, cut from gun barrels, which must be ground on one face to a good finish, for etching in a steel analysis. It's a tough grinding job because of the large area involved in many of the billets.

The Gardner No. 230-36" Disc Grinder seen here, handles billets, ranging from 2¾" up to 7⅝" O.D., and removes about .010" to .015" stock. A quick-clamping fixture on a hand-operated lever table, is used. PRODUCTION: 15 to 20 per hour on an average size; say, 6¾" diameter.

Investigate GARDNER-GRINDING for Your TOUGH jobs—Ask for Bulletin 200B.

Use Modern GARDNER WIRE-LOKT Abrasive Discs on Your Disc Grinders!

GARDNER-GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

442 East Gardner Street • • • • Beloit, Wisconsin, U.S.A.

Amazing S-22 Synthetic
ETCHING STAMPS

Thousands of our new "S-22" Synthetic stamps now in service have proved that this new material outlasts rubber or other synthetics by from 3 to 4 times, when used with acid etching inks. Order "S-22" next time you need inspection stamps.

INSPECTOR'S KIT

Made of acid proof, non-critical material, this new Kit holds stamps, etching ink, ink pad and neutralizer. Inexpensive, compact and convenient. Write for quotation.

Write for Bulletin S -- Catalog 146

This valuable bulletin illustrates the various styles of stamps available. Write for your copy today.

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WILSON

MECHANICAL INSTRUMENT CO. INC

Compare this NEW SPEED with the Old Way...

True-Surfacing . . . Freehand

with

PORTER - CABLE

Wet-Belt Surfacer

● At a well-known bomber plant, the two faces of the aluminum casting shown must be finished at exact right angles, also true flat and glass smooth. With a Porter-Cable Wet Belt Surfacer these rigorous requirements are met with only one application of each face to the belt and ***without mounting the piece in a fixture!*** The entire area is finished at one time; it's unnecessary to take the time to pass a cutting tool over the whole length of surface.

● The belt never "loads" with cuttings. Its flexing action opens the abrasive surface and allows the coolant to wash the grits free and clean, thus insuring sharp, effective cutting. Moreover, the coolant overcomes all possibility of heat discoloration, warping or flowing of the metal.

● This amazingly adaptable precision tool replaces or supplements many operations on millers, surface grinders, planers, shapers — relieves them for other work; speeds the entire production flow.

The Porter-Cable Wet Belt Surfacer has been a revelation to many methods engineers and production men. Send for our new booklet, WET-DRY BELT SURFACING, virtually a text-book on this vital new machining process.

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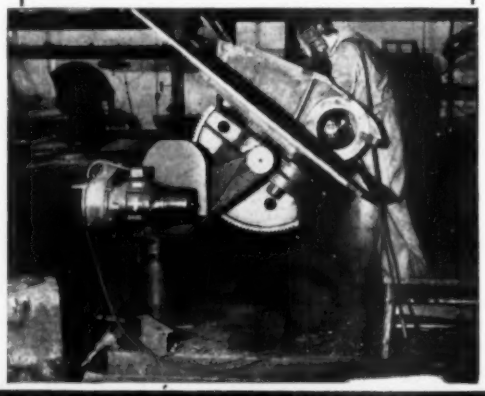
POSITIONERS

Cut Welding Time
Reduce Welding Cost
Improve Welding Quality

All sides, top and bottom, are welded downhand with one set-up. No waiting for the crane, no "handling" crew needed, for the welder himself rotates (360°) and tilts weldment (to 135° beyond horizontal) with a push button control. This "all-down", hand welding method permits use of larger rods, hence requires fewer passes and gives stronger, smoother, more uniformly flawless seams and joints.

C-F Positioners, pedestal mounted and adjustable for height, come in 6 capacities—from 1200 lbs. to 30,000 lbs. Manual, motorized or motorized variable speed operation.



Write for Bulletin WP-22

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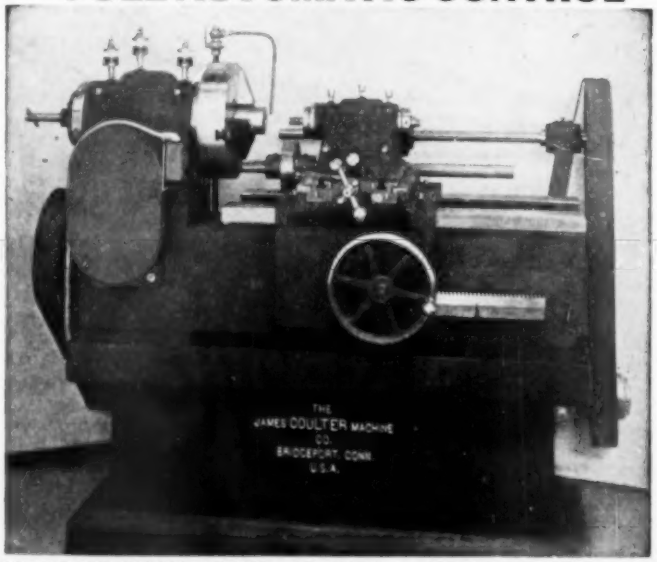
1318 S. KILBOURN AVE. CHICAGO, ILLINOIS

PRECISION THREAD MILLER
FULL AUTOMATIC CONTROL



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COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James* COULTER *Machine Co.
BRIDGEPORT • CONNECTICUT • U. S. A.

A. S. T. E. DOINGS

(Continued from page 208)

Ralph Ramsey; membership, Dayton Ekstrom; standards, H. Bartelt; constitution and by-laws, E. Broberg; educational, F. K. Tallmadge; advisory, Ed Dickett; Rock River Valley Engineering Council, Leo W. Reuland and Fred J. Kampmeier; historian, R. Hamilton; reservations, John Breutzman, and hotel arrangement, Harry G. Carlberg.

On June 13, approximately 125 members and friends attended the chapter's golf stag at Mauh-Nah-Tee-See Country Club. Plans now are under way for a Carbide meeting in September.

San Francisco: Possibility of an A.S.T.E. convention and small tool show in either San Francisco or Los Angeles was discussed by Adrian Potter, A.S.T.E. national executive secretary, at the Golden Gate chapter meeting June 11 at the Engineers' Club.

Progress currently being made on the West Coast in manufacturing has convinced the national executive committee of the advisability of such a show and conclave, Mr. Potter told the meeting. He also discussed post-war opportunities for tool engineers.

Following Mr. Potter's talk, three color sound films were shown on technical subjects. Two of the pictures, "Steel for the Ages" and "Exploring with the Microtimer," were furnished by the Allegheny Ludlum Steel Corporation. The Lindberg Engineering Company supplied the film, "Heat Treating Hints—Second Edition." Attendance at the meeting was about 100 persons.

South Bend: One hundred fifty-four members and guests attended the chapter's picnic held at Christiana Country Club June 19. Several sports events featured the program, including a golf tournament, horse shoe pitching contest, and a bait casting exhibition. Prizes were awarded winners in the various events.

Syracuse: S. A. Brandenburg, of the Monarch Machine Tool Company, presented an illustrated address on the Monarch-Keller Contour Machine Tool at the May 3 meeting at the Hotel Syracuse. Sixty persons attended the meeting.

At the June 9 session, W. E. Peterson, representing the Bellows Company, spoke on "Actual Operation of the Senacon Pneumatic Machine Tool." A film and demonstration of the tool in action accompanied his address. Attendance totaled 75 persons.

Tentative plans were laid at the meeting for the annual clambake to be held the first Sunday after Labor Day, if possible.

Tri-Cities: Telling the "Story of John Deere", Marshall McClain of Deere and Mansur Works addressed 91 members and friends of the chapter at a dinner June 7 in the Blackhawk Hotel in Davenport, Iowa.

Following the dinner the audience expanded to about 125 persons for the talk by Dr. Harry Osborn, Jr., on "Surface Hardening by Induction." The address received much favorable comment.

Lakehead Chapter is Newest A.S.T.E. Unit

Clarke Seaton photos

National President Ray H. Morris with new Lakehead Chapter officers at chartering ceremonies in Port Arthur's Prince Arthur Hotel.

ONE HUNDRED ASTE members and leading manufacturing executives of Fort William and Port Arthur, Ontario, gathered in the latter city July 19, for the formal chartering of the new Lakehead Chapter of the American Society of Tool Engineers. This newest ASTE unit raises the number of Canadian Chapters to five. The Lakehead Chapter, with 72 members, is the most northerly of ASTE organizations.

In an election conducted under Society rules, these officers were named: Chairman, Douglas R. Cooper, Branch Manager, Canadian Fairbanks Morse Company, Ltd., Fort William; First Vice Chairman, Arthur M. Woodside, owner, Woodside Brothers, Port Arthur; Second Vice Chairman, Alan D. Norton, Chief Tool Designer and Methods Supervisor, Canadian Car and Foundry Company, Ltd., Fort William; Treasurer, George B. Stanbrook, Machine Shop Foreman, Canadian Car and Foundry Company, Ltd., Fort William; Secretary, Phillip H. Spence, Training Supervisor, Canadian Car and Foundry Company, Ltd., Fort William.

In presenting the Charter, National President Ray H. Morris congratulated the members on the aggressive manner in which they organized the new Chapter, while maintaining the principles of the ASTE. He reviewed the accomplishments of the Society and outlined plans for the future.

An unusual feature of the Charter Ceremonies was the presentation by several Lakehead members of a bell which they made for use at Chapter meetings.

Lakehead Chapter officers (left to right): Philip Spence, Secretary; Arthur M. Woodside, 1st Vice Chairman; Douglas R. Cooper, Chairman; Alan D. Norton, 2nd Vice Chairman; George B. Stanbrook, Treasurer.

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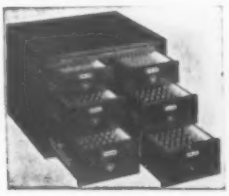

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DUBLIFE REVERSIBLE PLUG GAGE

A new plug end either "Go" or "No Go" is ready when used end is worn. Instantly reversible. Bronze split collet locks ends in same handle giving you **two gages in one.** Tolerances to 0.00002. UPPCO lapped insures **most lasting** finish.

Save critical materials by using DUBLIFE!

Catalog shows complete line of superior DUBLIFE Gages. Other Gages of American Gage Design also shown. Write

UNITED PRECISION PRODUCTS CO.

3517 West Belmont Ave., Chicago, Ill.

EVEREDE SPECIAL BORING BARS ★

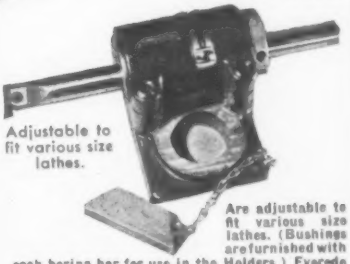
MADE TO SPECIFICATIONS with EVEREDE Triangle Bit

Micrometer adjustment with indicator dial on wrench. Assuring accuracy regardless of bit angle. Furnished with solid bits of Tungsten carbide "Stellite" or High Speed Steel.

READY FOR CUTTING. NO FORMING OR GRINDING NECESSARY.

Write for Folder.

EVEREDE BORING BAR HOLDERS



Adjustable to fit various size lathes.

Are adjustable to fit various size lathes. (Bushings are furnished with each boring bar for use in the Holders.) Everede Holders keep the boring bar in a horizontal position, regardless of any change in the size of the lathe, within limits. • The No. 1 Holder for lathes from 7" swing to 9". • The No. 2 Holder for lathes from 8" swing to 12", and the No. 3 Holder on engine lathes from 12" swing to 24".

EVEREDE BORING BARS

The ONLY Boring Bars with the Economical Triangular Bit.

Made of finest nickel steel, heat treated, uses a H.S. Steel or solid Tungsten bit. Bit cuts ahead of the bar and allows boring of a hole right up to the shoulder. Designed for rigidity and adaptability to all uses. Bars for lathe boring range from 7/12" to 3½". From 7/32" to 6¾" with precision ground shanks for jig boring.

EVEREDE TOOL CO.

WILLIS STUTSON

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Columbia TOOL STEEL

DEPENDABILITY—

For dependable results use correct types of tool steel for your tools.

You will get added production and tools will last longer.

Columbia Sales-Service men will be glad to help you.

It pays to use Good Tool Steel.

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Practically ANY OPERATION in Milling or Indexing Can Be Performed with

Zagar FIXTURES

Regardless of Shape of Piece

JUST ABOUT READY TO GO

• The new Zagar Horizontal Broaching Machine, for small jobs, will sell at a comparatively low price. If your present oversize equipment does not fill the bill, please tell us what the problem is.

← Milling slots $\frac{5}{16}$ wide x 2½" long. Zagar fixture holds and indexes. Clamping is done with standard fixture parts plus special plate and stud which were made in half a day's tool room time. Fixture is so solid that, despite unusual suspension of part from table, average of 54 slots can be completed per hour.

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23880 Lakeland Blvd. Cleveland, Ohio

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Offer you many advantages!

For tapping jobs that require unusual accuracy and a high rate of production—or for a set-up that involves a wide range of sizes, materials and shapes—this new PROCUNIER "Universal" Tapping Machine is ideal.

All adjustments can be made quickly and easily—such as regulating compensating spring pressure, setting depth stop, changing to any of the four speeds from 390 to 2050 RPM, or adjusting turning or flow of tap lubricant. Extra long compensating springs assures uniform tapping and reversing pressure ***independently of operator.*** Tap establishes its own lead for greater accuracy. Automatic tap lubricator provides abundant supply exactly when needed. Motor-driven continuous flow lubricant pumps also available. Has exclusive Procunier high-speed tapping head with double-cone friction clutch and TRU-GRIP tap holder which has many advantages. Many other features.

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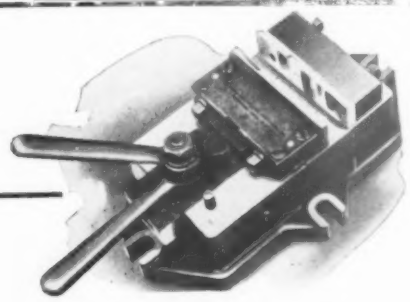
Speeds Gripping and Releasing!



POWER, SPEED, STRENGTH, and ACCURACY are obtainable with this Hartford "Four Point" Milling Vise. It features a dual-operation principle of handles which speeds gripping and releasing. The operator can easily apply tremendous power with one hand because both the cam-faced and binding handles can be manipulated at the same time. You get maximum strength because the base is of semi-steel and the movable jaw is single heat-treated steel drop forging. The movable jaw can accurately hold a single piece at either end of jaw because it has ground fitting surfaces. Jaws are in absolute alignment.

WRITE FOR LITERATURE

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

"E" TO UNIVERSAL FOR OUTSTANDING ACHIEVEMENT IN THE MANUFACTURE OF VITAL TOOLS . .

We are proud to announce that we have been awarded the coveted Army-Navy "E" in recognition of the quality and quantity of the Universal precision parts we have been producing for America's war effort.

You can improve your production with Universal Collet Chucks which grip as strong as solid steel in both a radial and axial direction without marring the tool shank. Write for complete Collet Chuck catalog.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH · MICHIGAN

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PRODUCTION TOOLS

ORIGINATORS AND MANUFACTURERS OF HELICAL FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

The Improved Nielsen Live Centers

LOAD CAPACITY—200 TO 40,000 LBS. AT 100 RPM.

HAVE ADJUSTMENT TO TAKE UP WEAR AND PRELOAD BEARINGS

STANDARD MORSE TAPER No. 2 TO 6 IN STOCK

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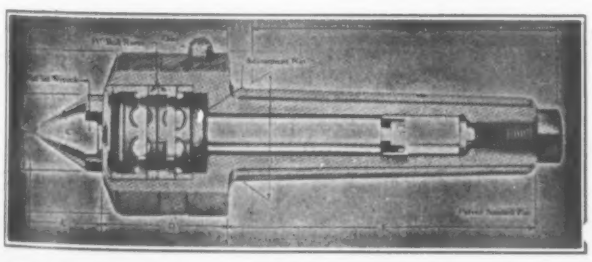

NIELSEN, INCORPORATED
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Fray RAM TYPE No. 7-B
VERTICAL UNIVERSAL MILLING MACHINE

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Used the world over for jig boring, die and permanent mold work, production operations, etc.

FRAY MACHINE TOOL CO.
505 W. WINDSOR ROAD, GLENDALE, CALIFORNIA
Makers of "All-Angle" Milling Machines & Milling Attachments

POST-WAR VIEWS: AIRCRAFT MANUFACTURING

(Concluded from page 111)

is building for war, he said, lies in an expansion of world-girdling air passenger lines, and the maintenance of an international police force to preserve the hard-won peace. Both of these developments would offer a small but substantial market for large ships. Airplanes, he is certain, will not replace trains, ships or the automobile.

Though aircraft building may go through a period in which manufacturers try to outdistance each other in huge designs—as was the case in shipbuilding with the Normandie and Queen Mary—the big plane which will be adopted will be one which is most efficient in operation in relation to its speed and load capacity.

"Just what size that ship will be, I wouldn't be foolish enough to prophesy," he said. "Much is contingent on the power available. And I do foresee tremendous developments in power plant engineering."

On the subject of materials in the post-war airplane, Woodhead admitted he was prejudiced, having formerly been connected with the steel and automobile industries.

"Wood in a plane of any size is merely a war-time expedient to beat material shortages. Aluminum, magnesium and the light alloys will find ample use in the smaller and medium size planes. I look for the use of pressed steel in big ships."

Asked if standardized design would permit mass-production in peacetime aircraft building, the Consolidated official said, "yes, to a certain degree and with qualifications."

"Today we are making nearly 200 vital design changes a month on the B-24 four- engine Liberator bomber for the U. S. Army. Yet, we are in mass-production.

"Every airline which orders planes will dictate changes in any basic design we might have in production. But most of these changes will come before work is started on the order.

"If you call conveyorized plants mass production," he added, "we will have it with orders of 30, 50 or 100 planes. The aircraft builders are not going to throw away the lessons they learned from the automakers—and the use of conveyors is one of them."

AUTO VERSUS AIRCRAFT METHODS

Though Ford, North American Aircraft and Douglas Aircraft are currently engaged in all-out production of planes from Consolidated designs, and have built new facilities for this work, Woodhead said he believes that the most completely mechanized plant in the entire aircraft industry is the Consolidated Vultee factory at Downey, California.

Regarding the auto versus aircraft methods of manufacture in building war planes, he said the two philosophies have met half way to their mutual benefit. On the hard versus soft die argument that raged for months, he explained that it is now agreed all around that both methods are indispensable.

"We are using hard dies on the same work on which automen use them. And," he added, "the auto plants are using plenty of soft dies."

Speaking about Detroit's influence on aircraft manufacturing, Woodhead observed that "every second man in our industry is an ex-auto man."

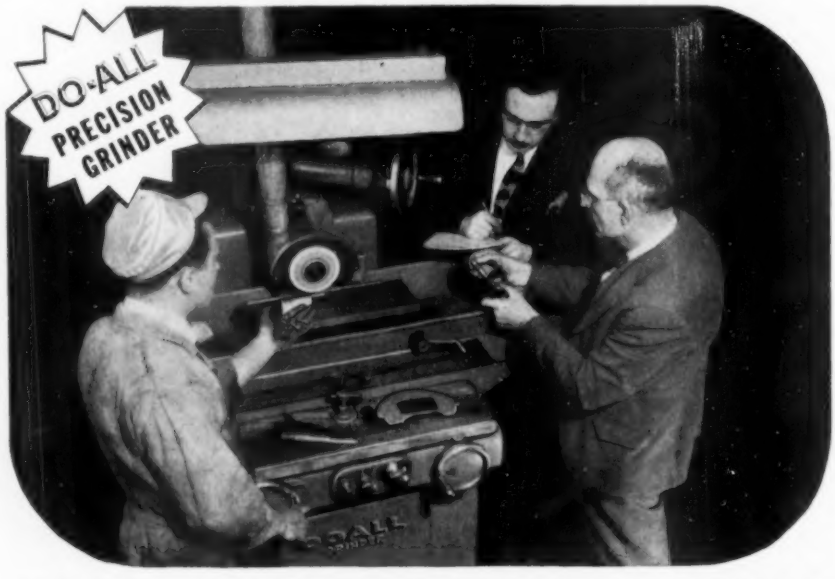
EXCESS POST-WAR FACILITIES

Admitting frankly that Termination Day will catch such concerns as Consolidated with tremendous unusable productive facilities, he declined to say how much he estimated his own concern would use for aircraft work, and how much for the rumored consumer products some aircraft builders are believed to be readying for the post-war market.

"If you had the designs of products that could be turned out in the unused factory space and on the unused machine tools on your hands when war ends, would you go into such production?" Woodhead was asked. He smiled broadly. "Yes," he said, "we'd like to put our unused plant capacity to work."

This president of the largest plane manufacturer in the nation said his organization was engaged in post-war planning, but that such activities are completely separated from war work. "No one connected with the design or production of our war products has anything to do with our post-war planning," he explained.

"After the war," he added hastily, "the successful aircraft builder will be building aircraft, and the successful automobile builder will be building automobiles." THE END.



.0001" TOLERANCE ON 4 SIDES

In one modern Pennsylvania plant, keys ranging in size from ¼ to 1⅛" wide and from ⅛ to ⅜" thick were ground to give a .0001" tolerance on 4 sides over all. There was only 1 reject in 2500 pieces.

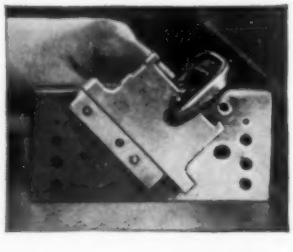
THE DO-ALL HAS EVERYTHING

Here's a direct drive Surface Grinder with 1140 square inches of hand scraped bearings and mechanism safely sealed inside. A magnetic chuck holds work firmly without clamps. Vibration is practically nil because the DO-ALL is sturdily built—weighs more than a ton. Adaptable to wet or dry grinding. Comes in two models.

You'll like the DO-ALL—it's easy on the operator, easy on the work and easy on your budget. It will turn out super-smooth jobs for you in quick time and has a ruggedness that will stand the gaff of continuous operation long after other equipment has given up the ghost.

Send for data about the two DO-ALL models.

A Boring Cutter ground on the DO-ALL. Two cutting edges ground to .001. Clearance and step-down ground to .002. Keyway ground from side to side to .0001.



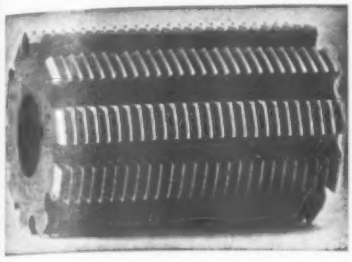
Fixture used to hold the Boring Cutter to 45° angle, tolerance held to .001.

SAVAGE TOOL COMPANY
DEPT. TE, SAVAGE, MINN.

DO-ALL Offices in 25 cities, with a staff of trained engineers to give you quick service on Surface Grinders, Gage Blocks, Contour Machines, Band Saws and Files.

THREAD MILLING HOBS & COMBINATION CUTTERS

Class 1 or 2 or 3 fit in any thread system and thread angle

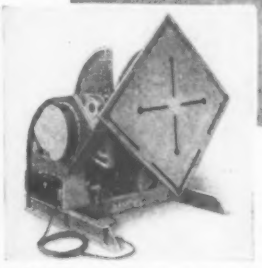


Shell hobs up to 7" O.D. and 5" width Taper shank hobs to 12" overall length.

On orders more than 25 hobs—1st shipment within ten days.

U. S. MACHINE TOOL MFG. CORPORATION

Phone 85 Clinton, Indiana



6,000-lb. capacity unit.

In handling the cumbersome frame assemblies illustrated, the welders can swing them through 360° and tilt them as far as 135° beyond horizontal. Both men and women welders like Ransome equipment because it steps up their production and reduces fatigue.

POSITIONING PERMITS YOUR WELDERS TO CONCENTRATE ON WELDING . . .

It's certainly not good business to waste welders' time and energy in "rasseling" the work around . . . not when a Ransome Positioner will do the job at the touch of a switch.

This equipment improves quality by providing the correct downhand position for every weld, saves valuable floor space, promotes safety, and speeds up welding production generally.

There's a type and size for *your* welding needs . . . in a line that extends from light-duty hand-operated up to 40,000-lb. capacity. » *Write for full information.*

Ransome WELDING POSITIONERS

INDUSTRIAL DIVISION • RANSOME MACHINERY COMPANY • DUNELLEN, NEW JERSEY

WELDON ROBERTS

Brightboy

REG. U.S. PAT. OFF.

FOR "ALL-IN-ONE"

FINISHING, DE-BURRING, POLISHING

- Bridges the gap between a grind and a buff.
- Does not load, gum or fill.
- Works metals with minimum dimensional loss.
- Requires no special preparation.
- Gives a precision finish that frequently serves as a final polish.
- Made in wheels, blocks, sticks, rods,—for manual and machine operations.

Write us if your dealer cannot furnish you with Methods and Applications Data, samples and prices. Our field representatives are at your service.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER COMPANY
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ARMSTRONG

Drop Forged Wrenches

For industrial use and wherever quality counts, ARMSTRONG WRENCHES are preferred, for their extra strength, improved designs, finer steels, correct heat treatment, accurate openings and better balance.

Over 100 types, each in all sizes, Drop Forged Carbon and Chrome-Vanadium Steel Open End and Box Socket Wrenches . . . Chrome Vanadium Detachable Head Socket and Hollow Screw Wrenches . . . Great Construction Ratchets . . . Special Wrenches of all types on short notice—standardize on "ARMSTRONG WRENCHES" they are the finest obtainable. Write for Catalog C-39.

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"The Tool Holder People"
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THE PASSING PARADE

T. M. REG. U. S. PAT. OFF.

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Wales-Strippit Corporation, North Tonawanda, N. Y., announces appointment of **Henry K. Beebe** as works manager. Mr. Beebe formerly was associated with the Brewster Aeronautical Corporation as chief plant engineer and adviser to the works manager. His background includes production experience with Ford Motor Company, Dodge Brothers, American Car and Foundry Company, and General Motors.

John S. Higgins, industrial relations manager for Little Rhody chapter of A.S.T.E., has been appointed vice-chairman of the new chamber of commerce industrial cabinet at Providence, R. I. Work of the cabinet will be under direct control of leaders of industry in the Providence area.

Lieut.-Col. **Edward M. Levine,** 38, formerly field engineer for Cincinnati Milling and Grinding Machines, Inc.,

Lieut.-Col. Edward M. Levine
Killed in action in North Africa

was killed in action on June 15, 1943, in North Africa, according to word from the War Department. He was a member of the Army Air Force, having joined that branch of the service in March, 1941.

Col. Levine, a member of Pittsburgh Chapter No. 8, A.S.T.E., was a graduate of Washington State University, class of '29. Except for two years, he had been working for Cincinnati Milling since his graduation. He was transferred to Pittsburgh in 1937, where he lived until joining the Air Force in 1941.

New director of the war production division of Brown & Bigelow, St. Paul, is **Francis E. Gruber,** chairman of A.S.T.E. Twin City chapter. He has been associated with the company since 1934 in charge of engineering and tool design.

George M. Williams, well known in automotive and aviation circles, has joined the Curtiss-Wright Corporation and will be made vice-president to assist the president in an executive capacity, according to a company announcement.

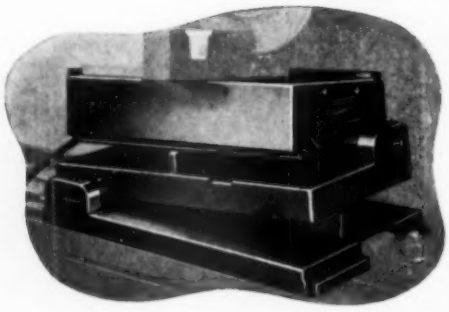
(Concluded on page 218)

George M. Williams
Associated with Curtiss-Wright

ANGULAR GRINDING

INCREASED MANY TIMES OVER WITH

MAGNA-SINES



A Magna-Sine should be available for every machine on which an average volume of angular grinding work is done.

The Magna-Sine saves valuable minutes — or possibly an hour or more — when any individual angular set-up is required. Multiplying this saving of time by the number of jobs on various grinders, you find the means to get many additional PRODUCTIVE HOURS from your equipment. No other chuck or similar device offers the precision accuracy of the Magna-Sine in grinding work requiring either single or compound angles.

Write For Full Information

The MAGNA-SINE

ROBBINS ENGINEERING COMPANY

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Special
LIVE CENTER SET-UP
REDUCES SCRAP
on vital aircraft engine part

Battery of Ex-Cell-O Thread Grinders Involved in Operation

Operator at N. A. Woodworth Company, Ferndale, Michigan, putting another part on specially designed Sturdimatic Live Center

They had trouble with ***dead centers,*** during a precision grinding operation at N. A. Woodworth Co., because of deep scratching. Emery, in the coolant, was getting between dead centers and a highly polished spherical radius hole, in the part, that was used for support between centers . . . We designed a special STURDIMATIC LIVE CENTER which, revolving with the part, stopped all movement between the highly polished concentric surface and the center, eliminating the trouble at the source—without any rubbing action, the emery in the coolant had no bad effect . . Scrap had been running high—threads had to be ground concentric with the spherical radius hole within very close tolerances and production of thousands per day had to be maintained. So here a substantial saving on a vital war part was accomplished by using a STURDIMATIC LIVE CENTER . . . standard shanks with Morse taper carried in stock . . . send for a catalog.

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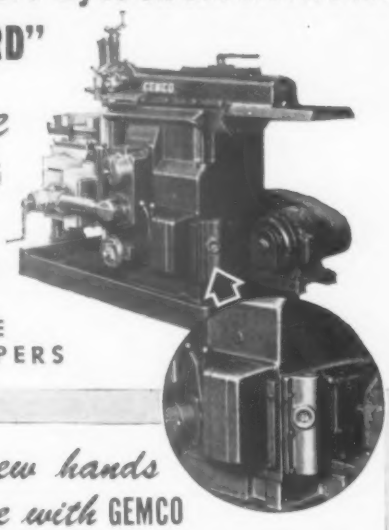
TOOL COMPANY
5218 Third Avenue
DETROIT, MICHIGAN
LIVE CENTER

Keep Operators' Eyes on the Work Piece

"LUBRIGARD"
THE
Exclusive
LUBRICATING
SYSTEM
GEMCO
MULTI-
PURPOSE
SHAPERS



Why new hands Produce with GEMCO

Man hours saved, high production peaks accomplished by operators new to industry, that's what GEMCO is credited with. **First** the "LUBRIGARD" system keeps SHAPER functioning perfectly with absolute ease to operator. Preventing injuries to the operator or damage to the machine or work piece. **Second** GEMCO'S simple precision construction embodying centralized handy control lever operation and large, easy to read dials permits continuous easy operation.

Good Deliveries! Write for Bulletin GC12T

GENERAL ENGINEERING & MFG. CO. ST. LOUIS MISSOURI

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MULTIPLE V-BELT DRIVE ASS'N

Pyott Multiple V-Belt Drives conform to all the engineering specifications established by Multiple V-Belt Drive Association.

PYOTT

FOUNDRY & MACHINE CO.
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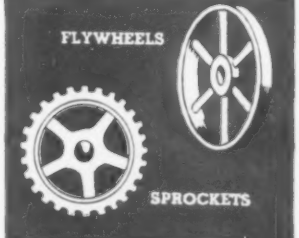
Put your drive problem up to Pyott for constructive suggestions. Descriptive literature sent upon request.



ALSO GREY IRON AND SEMI-STEEL CASTINGS

NEW BOOKLET
Describes
LIGHT WAVE MEASUREMENT
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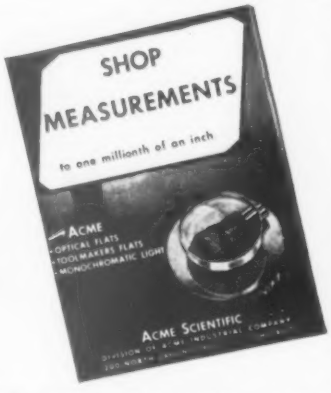

IT'S YOURS FOR THE ASKING . . . !

Just off the press . . . Acme's new booklet "SHOP MEASUREMENTS to one millionth of an inch", describes in simple detail how Acme Optical Flats are applied in the procedure of lightwave measurement.

Illustrations and diagrams show how these flats can be used to check surface flatness, as well as their use for accurate comparison measurement in connection with precision gage blocks.

In short, this new booklet has been written in non-technical terms to make it easy for the average mechanic to thoroughly understand how to apply lightwave measurement in shop practice.

Write for Your Copy Today . . . !

ACME

ACME INDUSTRIAL CO.
Makers of Standardized Jig and Fixture Bushings
208 N. Laflin St. MONroe 4122 Chicago, Ill.

He has held many executive positions, including important posts with Dayton Wright Airplane Company, Manufacturers Aircraft Association, Wire Wheel Corporation, Marmon Motor Car Company, Russell Manufacturing Company, and Vultee Aircraft, Inc.

Landers, Frary & Clark, New Britain Conn., announce the promotion of **Leland A. Brown** to vice-president in charge of manufacturing and works manager of all the company's plants. He is a member of the A.S.T.E. Hartford Chapter.

E. P. Jeffery, vice-president of the American Blower Corporation, died July 8. He was 56 years old. Starting to work for the company as a mechanic in 1906, Mr. Jeffery advanced until at the time of his death he was in charge of manufacturing for all of the American Blower plants. He was a past president of the American Welding Society.

Died: **Charles H. Wilkinson,** president of Logansport Machine, Inc., at Cleveland, Ohio, July 13, while on a business trip. He also was president of the Cotner-Wilkinson Corporation, Logansport, Indiana.

R. T. Palmer, owner of the R. T. Palmer Co., died recently at his home in Hartford, Conn., at the age of 44. He was well known to the machine tool industry through his connections with many leading tool and gage manufacturers. A graduate of Brown University, Mr. Palmer was vice-chairman of the Hartford Chapter of A.S.T.E. and a member of the American Legion.

R. T. Palmer
Died at Hartford, Conn.

Earle D. Parker, vice-president and general manager of Barber-Colman Company, died June 12 following a heart attack. He was 63 years old. Mr. Parker had been with Barber-Colman for 40 years, the past 20 years as works manager. He was made vice-president last fall.

E. C. Brandt, formerly of Westinghouse Electric, is new works manager for the Elliott Company, Jeannette, Pa. He is responsible for all manufacturing operations. During his tenure at Westinghouse, begun in 1905, he served as manager of the tool and equipment division and sales manager of renewal parts and service.

Wallace W. Leipner has been named acting chief engineer for American Welding Company, Warren, Ohio, according to a company announcement. He joined the concern in 1941 as assistant to the vice-president in charge of engineering. Formerly he had been associated with Porcelain Steels, Inc., H. K. Ferguson Company, and the Austin Company.

Also promoted by American Welding was **Verne Wildman,** formerly general foreman of the machining department. He has been made assistant superintendent.

William E. Sykes, formerly associated with the Farrell-Birmingham Company at Buffalo, died July 19, in England, according to a company announcement. He was widely known for his invention of a continuous-tooth herringbone gear and a gear generating machine, and held more than 100 patents. Author of numerous technical papers, he was considered an eminent authority on gear engineering.

THE END

Production at New Peak on

JOHANSSON GAGE BLOCKS

REQUIREMENTS of extreme manufacturing precision in war industries of the United Nations have made unprecedented demands upon our output of Johansson Gage Blocks, and we regret that our customers have had to wait so long for delivery even though every order is on priority.

Though we have increased production to the highest peak in history and speeded up deliveries, there is a long waiting list to be filled. But it is smart to place your order now. If it is on file, your chances of getting early delivery are a great deal better than they have been heretofore.

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Ford Motor Company, Johansson Div.
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WIRE ROPE CLAMPS

Write for details of this—the only PERFECTED wire rope clamp on the market. Used by the Armed Forces and thousands of industries.

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STURTEVANT QUALITY

Protect!...

STURTEVANT TORQUE WRENCHES protect the performance and life of most U.S. Aircraft engines — not only travel in the tool boxes but are used to control the torques applied in their manufacture. They are used to assure the uniform "set" of vital screws, to prevent uneven strains and warping, to gauge the set of spark plugs, to measure frictional drag, etc. Sizes to accurately measure torque from 0 to 7200 in. lbs., they eliminate guess work and haphazard tightening. They are introducing new accuracy in the manufacture of even the most delicate instruments . . . also come in sizes for the heaviest work. Products of STURTEVANT, pioneer manufacturer of accurate torque wrenches, they have the flat beam which eliminates all springs, adjustments and fragile mechanisms or moving parts. They are PERMANENTLY ACCURATE.

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

NO MATTER HOW LARGE OR SMALL—

MERZ CAN MAKE IT!

● In the design and manufacture of high precision gages, tools, fixtures and special machines, this organization offers 16 years of experience and the finest facilities in the central states. Our equipment for contract production of tools and parts, too, is unusually ample and complete, while our stock of standard ring, plug and thread gages is sufficient for immediate shipment of most types and sizes. Write for literature.

MERZ *Engineering Company*
INDIANAPOLIS 7, INDIANA

When Cutters Meet
RAW STOCK

GUSHER
COOLANT PUMPS
ARE ON THE JOB

The copious, dependable flow of coolant supplied by Gusher Coolant Pumps helps your skilled workmen and machines produce ***more.*** Reduces wear and tear on tools.

No metal-to-metal contact . . . not injured by small chips and grit . . . simple in design, Gusher Coolant Pumps are the favorites of plant superintendents and workmen.

There's a Gusher to meet your requirements. Write.

THE RUTHMAN MACHINERY CO.
1815 Reading Road Cincinnati, Ohio
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

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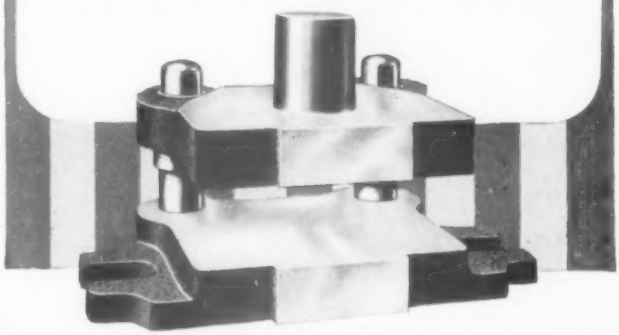
PRODUCTO
DIE SETS

To help speed up production of tools for war production in all parts of the Country Producto Die Sets are available for shipment from our two factories mentioned below. Also, Die Supply Company, 4747 Hough Avenue, Cleveland, Ohio.

Pacific Coast users will find stock of Die Sets and Accessories at Jamison Steel Corporation, San Francisco and Los Angeles.

Our No. 9 Die Set Catalog gives complete engineering information on Die Sets and Die Makers' Accessories.



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Automatic Feed Surface Grinder
No. 2B

Equipped with Motorized Spindle

A Proven Product for Over a Quarter Century with Thousands in Use Daily

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Agents in all Principal Cities Throughout the World

...avenging "Torpedo 8"

"Wright engines powering Avenger torpedo planes have performed in brilliant style" . . . recently stated a Navy Executive, ". . . and helped to revenge the Torpedo Squadron 8, wiped out almost to a man during the battle of Midway." The Avenger is powered with the Cyclone 14 Engine.

SCHAUER Speed Lathe finishing parts of the Cyclone 14 Engine at the Wright Aeronautical Corp. plant in Ohio.

Best Performance with Precision Finishing

Magneto shafts for the Wright Cyclone 14 Engine are burred and finished for a precision fit with the **SCHAUER Speed Lathe** after each of four cutting operations. *These parts must be accurate — lives depend upon their performance.* For finishing, burring, polishing, lapping of small metal or plastic parts use **SCHAUER IDEAL Speed Lathes.** Many *standard* models.

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SCHAUER MACHINE CO.
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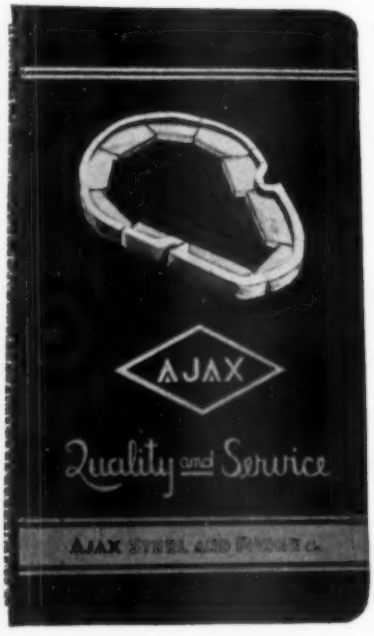
Send for Valuable Booklet

Forgings For All Industries
Rough Turned or Finished Complete



Composite Die Sections
Extrusion Tools
Crankshaft Forgings
Gear Forgings
Die Casting Dies

Rings, Discs, Blocks Shafts, Hubs, Bars, and Special Shapes. Tool Steel of all Makes

S.A.E. and N.E. SPECIFICATIONS

Stainless & Copper Forgings

May we Serve You?

AJAX STEEL & FORGE Co.
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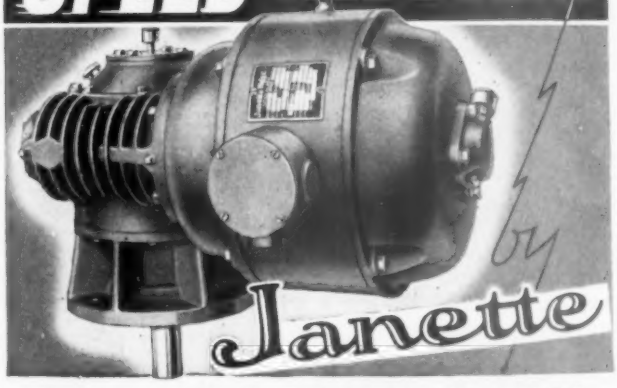
SPEED REDUCERS



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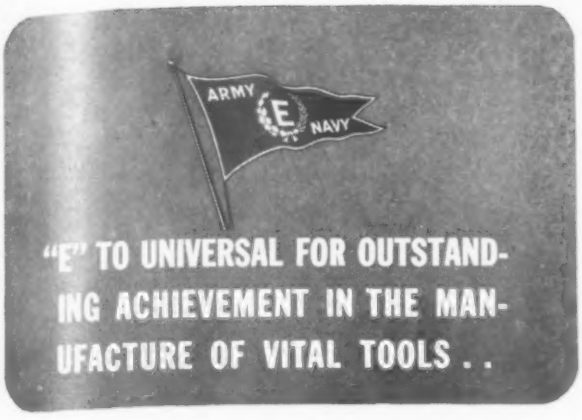

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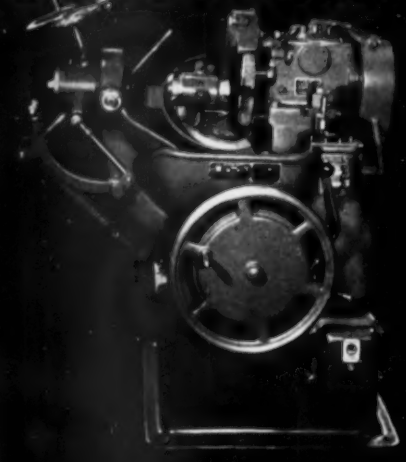

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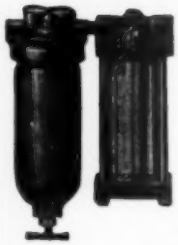

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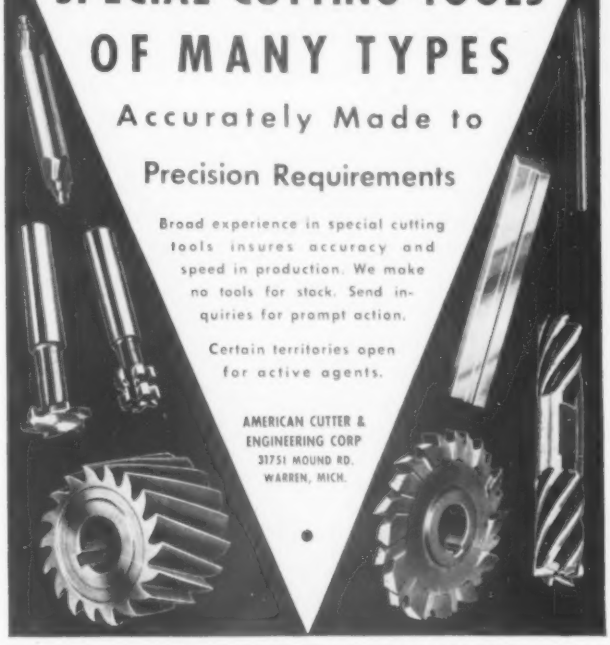

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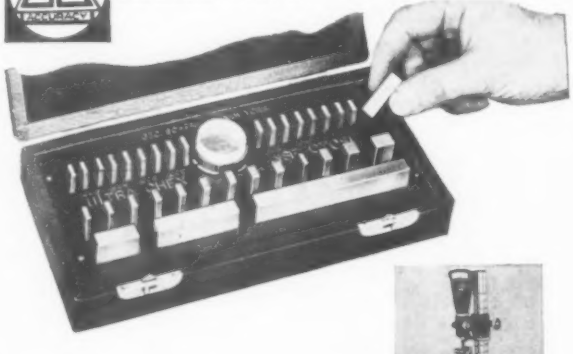

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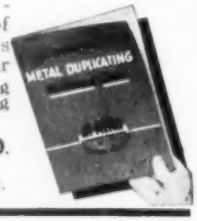

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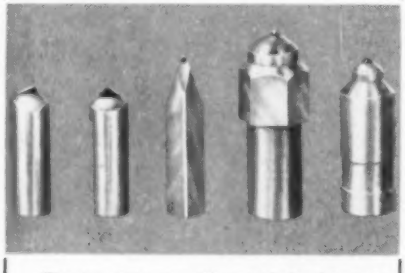

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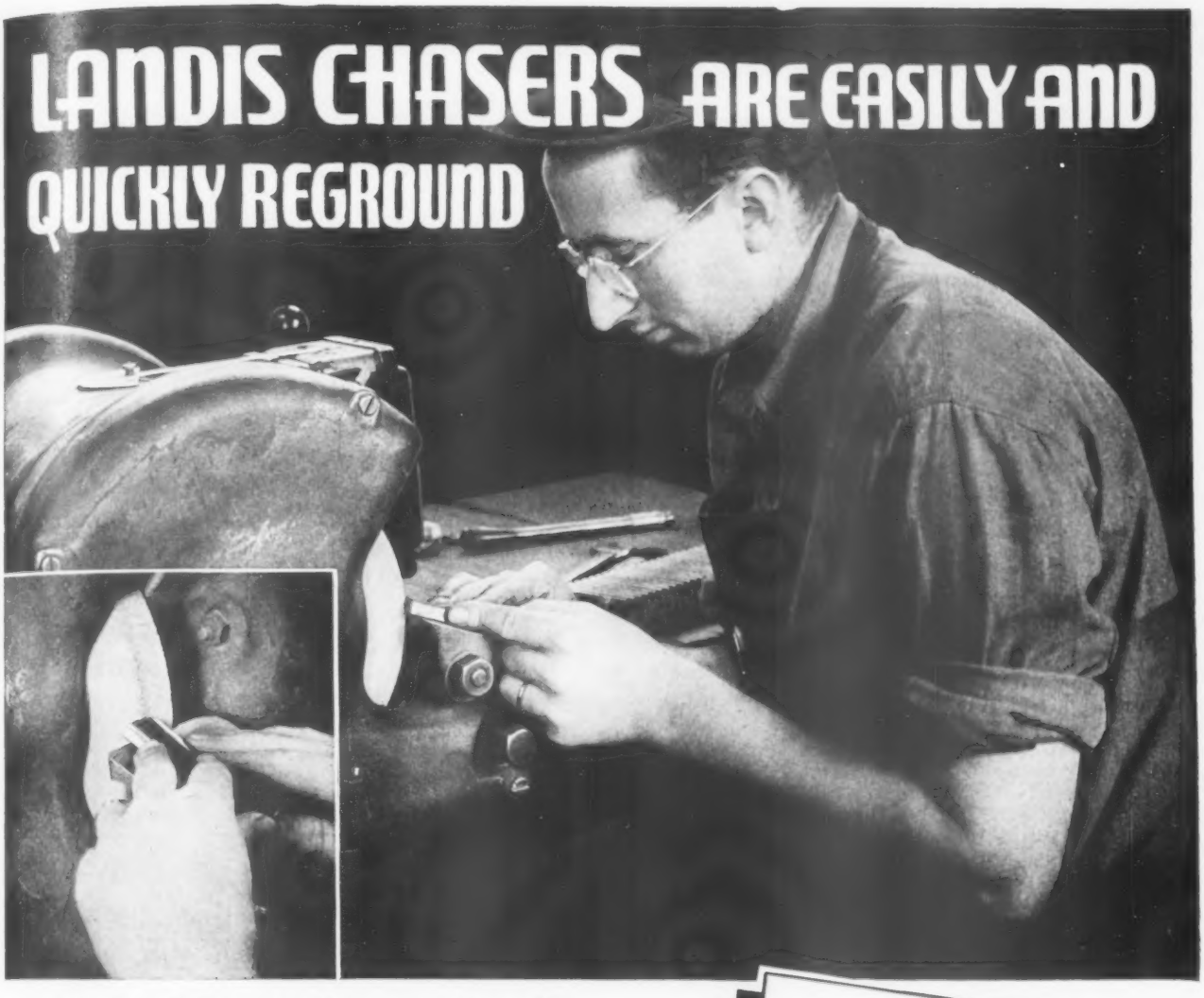
LANDIS CHASERS ARE EASILY AND QUICKLY REGROUND



A simple grinding operation renews the entire cutting edge and leading feature, retaining, after each grind, the initial accuracy of the chaser.

Avoid overheating, use mechanical rests, check throat and lip rake angles, grind uniformly and only so much of the chaser as is worn and you are assured quality threads and long chaser life.

The Finest Thread Cutting Tool in Industry

12 Features of the LANDIS TANGENTIAL CHASER

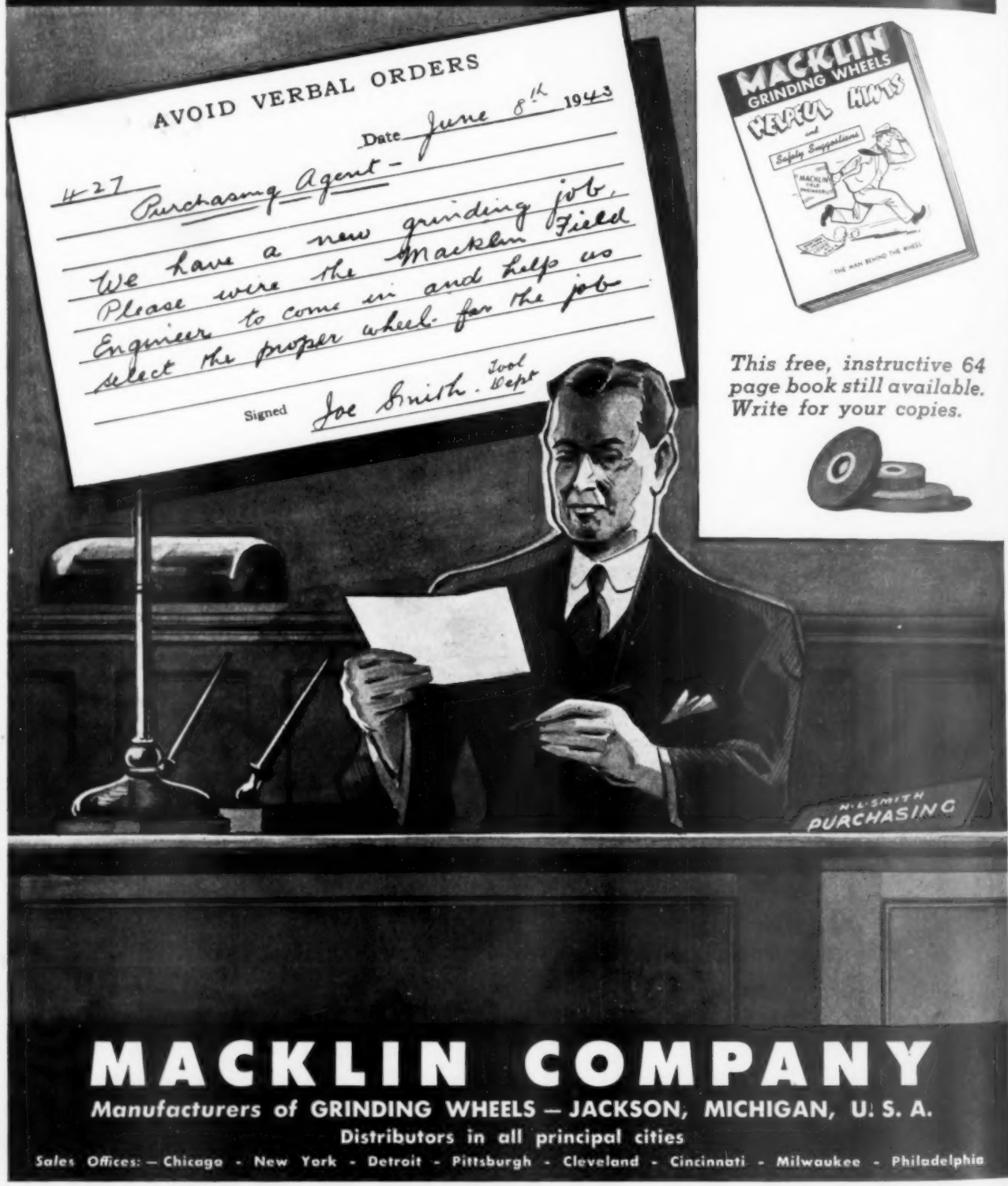
1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

LANDIS MACHINE COMPANY

WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

MACKLIN GRINDING WHEELS


AVOID VERBAL ORDERS
Date June 8th 1943
#27
Purchasing Agent -
We have a new grinding job,
Please were the Macklin Field
Engineer to come in and help us
select the proper wheel for the job
Signed Joe Smith. Tool Dept
MACKLIN GRINDING WHEELS
HELPFUL HINTS
Safety Suggestions
THE MAN BEHIND THE WHEEL
This free, instructive 64 page book still available. Write for your copies.
N. L. SMITH
PURCHASING

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

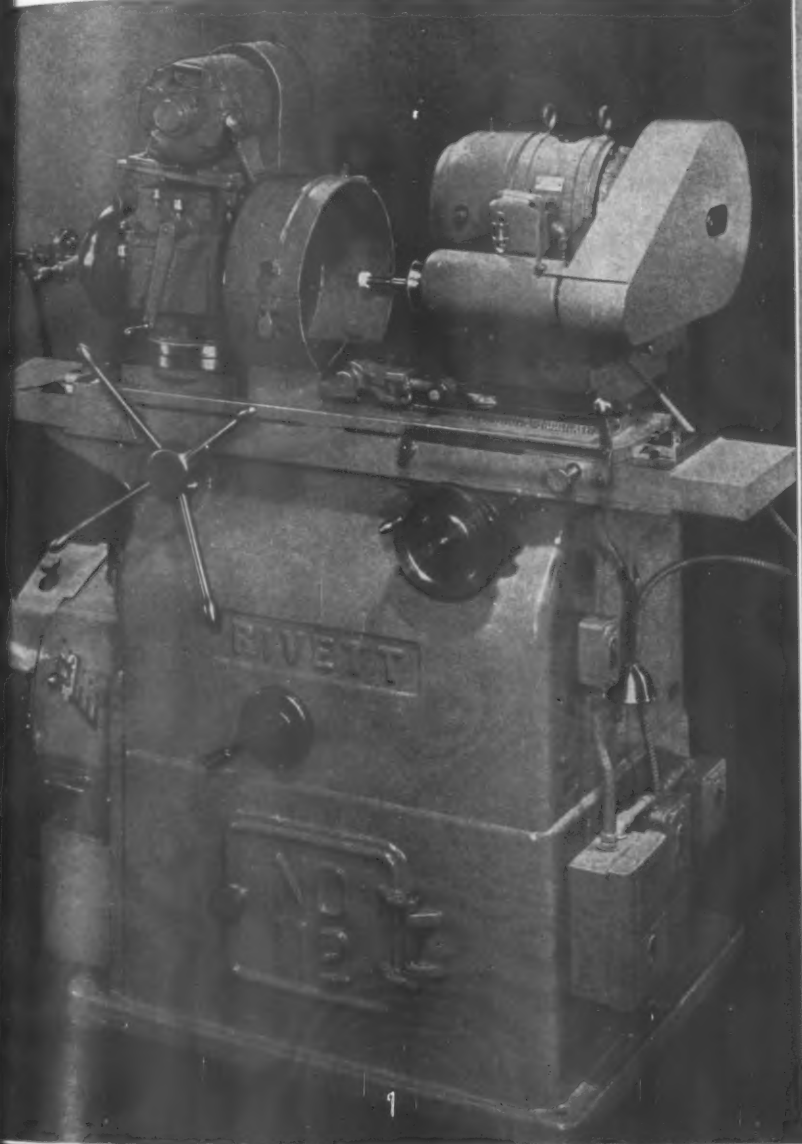
RIVETT

12 UNIVERSAL GRINDER

For Straight, Taper, Bevel or Straight and Bevel Grinding

The Rivett No. 112 Universal Precision Grinder is primarily for tool-room work. Available internal and external spindles in combination with many adjustments make possible a great variety of grinding operations. Extreme simplicity of design enables any mechanic familiar with grinding to operate the machine.

Work may be held in collet, step chuck, jaw chuck or fixture and driven at required speed. Power table reciprocation may be set at one of eighteen selective speeds, from 10 to 86 passes per minute. Length of table travel is infinitely adjustable between ½" and 8". High or low speed internal bracket or external spindle bracket, all as illustrated, may be [illegible] as required on cross slide. Workhead, table and cross slide are swivelled individually or in combination for taper and bevel grinding.



High Speed Internal Spindle

External Spindle and Tailstock

SPECIFICATIONS

Grinding cap., hole dia.	⅛" to 8"
Grinding cap., outside dia.	up to 8"
Automatic table travel	½" to 8"
Table speeds	18 selective
Hand table travel	15"
Swing over table	14"
Workhead swivel	90°
Table swivel	5°
Cross slide swivel	30°
Cross feed graduations	.0005"
Travel of cross slide	3½"
Collet capacity	1"
Step chuck capacity	8"
Jaw chuck capacity	8"
Workhead spindle speeds	150, 380, 600 r.p.m.
Grinding spindle speeds:	
Standard int.	4600 and 10000 r.p.m.
High speed int.	25000 r.p.m.
External	3300 r.p.m.
Automatic Oil Lubrication	
Net weight with motors	3700 lbs.

For Further Description Write for Bulletin 112

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

No. 9 in a Series of Tips on "Keeping 'em Turning"
by Arch Metzgar, 43 years at LeBlond.

I'm Tellin' You...

Eight of my sidekicks here at LeBlond have already given you lathe operators some tips on taking care of your machines. But I'd like to hand out some reminders on how to take care of *yourself*. A lathe really isn't a dangerous machine unless the operator gets careless or forgets one of these common sense rules. A good way to be sure you'll be on the job every day is to remember all of them.

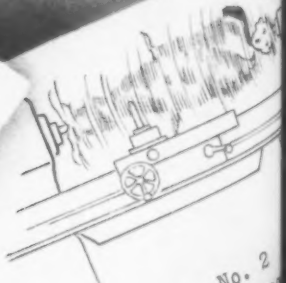
STOP

STOP YOUR MACHINE BEFORE YOU -

1. Caliper your work
2. Clean chips from work or tool
3. Oil or wipe machine

FASHION NOTE - No. 1

Save your eyes. They're the only pair you have. Wear goggles when your operation makes the chips fly.



FASHION NOTE - No. 2

Jewelry is excess ba
gage. Don't wear r
wrist watch, or poc
chain. You might
the whirl of thing
fore you know it.

HOLD TIGHT

Mount work securely, clamp as close to tool post as possible. Be sure tool is in correct position.

WATCH YOUR STEP

See that the floor around your lathe is always clean. Keep oil wiped up. It's slippery. Don't let chips and shavings pile up. Don't let your mind wander.

FASHION NOTE - No. 3

Don't feature a collegiate drape shape in your work clothes. Wear tight fitting clothes with no tie, or tie tucked in. Roll up your sleeves.

ARMY E NAVY

THE R. K. LeBLOND MACHINE TOOL C

CINCINNATI, OHIO

Largest Manufacturer of a Complete Line of Lath

MACHINE AND TOOL ENGINEERING

The TOOL ENGINEER

SEPTEMBER, 1943

Official Publication of American Society of Tool Engineers

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PAGE

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PAGE 4

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Is Jack and Heintz a War-time Sideshow?
PAGE 101

ENEMY DOLLARS

A dollar needlessly spent is an investment in the Axis war effort. It does exactly what the enemy hopes it will do. Won't you re-figure your budget and find a way to increase your regular purchase of war bonds thru payroll deduction . . . to keep your dollars fighting on our side?

NEW BRITAIN AUTOMATICS

NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

Remember, the deduction from your pay for income taxes merely meets an expense you would have to pay in a lump sum on the old plan. Don't let it stand in the way of war bond purchases.

UBLISHED BY THE BRAMSON PUBLISHING COMPANY

The KELLER that cut capers

A Short Story from P & W's Files

TIRED from a twelve-hour tussle with a tough problem in one of our customer's plants, a Pratt & Whitney field service man arrived at his hotel and found another call for help from a plant 300 miles away. Keller Machine trouble . . . something wacky with the controls. Our man wearily boarded a train and reported the next morning.

Yes, there it was, the Keller that cut capers. It had been running perfectly for a year in the hands of one operator, but since a second shift was put on, there had been difficulties. Our man opened the control box, found two relays out of adjustment, and fixed them. But just on a hunch, he waited around until the second-shift man arrived in mid-afternoon.

The Keller, you know, is an interesting machine. You make up exactly the shape you want out of plaster or wood or whatever is easiest. A tracer on the machine "feels" out this master shape, and controls a cutter down below working in tough die steel. It carves out complex two or three dimensional shapes with ease . . . to very close tolerances. Controlling the operation is a set of electrical relays . . . a fascinating study for anybody with an inquisitive nature.

The second-shift operator turned out to be just that kind . . . a bright young man, earnestly trying to get ahead, but without much knowledge of electricity. Yes, he admitted shamefacedly, he'd been tampering with the works . . . "re-adjusting the relays" . . . playing with it.

Our man gave the boy a brief lecture on the need for letting well enough alone . . . suggested to the superintendent that the boy be required to study the instruction book. It was done.

That was eighteen months ago. Latest word is, "The Keller has been running smooth as silk . . . control box locked up . . . has had no attention except periodic dust removal."

* * *

Most of the small amount of Keller trouble we've had boils down to that . . . well-meant tampering by inexpert hands. The solution is as simple as that . . . keep them away from it. There's nothing delicate about the Keller . . . run it the way the instruction book says, and you'll get plenty of production with no regrets.

PRATT & WHITNEY
Division Niles-Bement-Pond Company
West Hartford, Connecticut

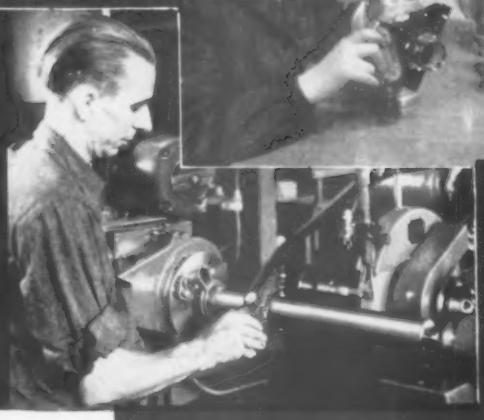
PRATT & WHITNEY

MACHINE TOOLS ★ SMALL TOOLS ★ GAGES

WEST HARTFORD CONNECTICUT

Basic Accuracy for Mass Production

STANDARD Dial Snap Gage

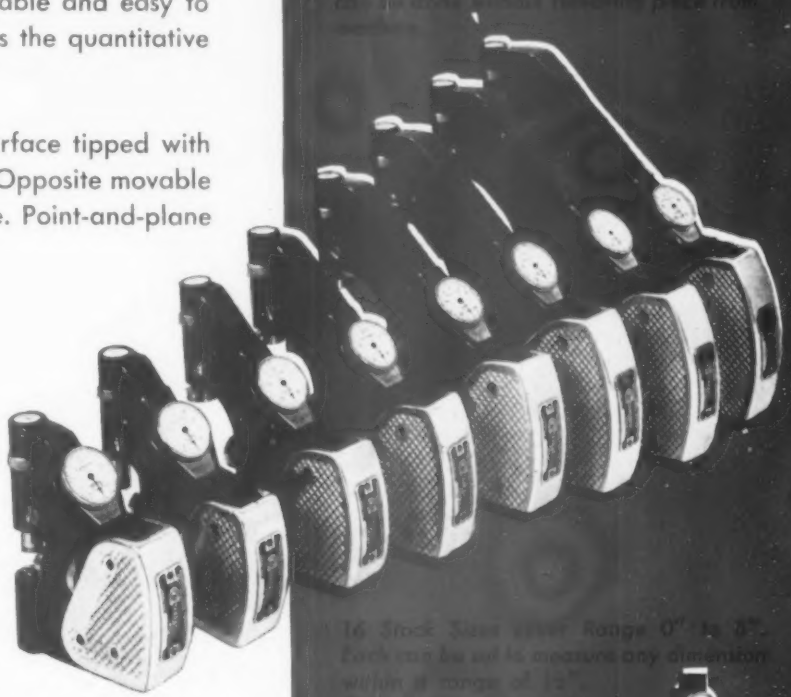


ACCURATE as a Bench Comparator but FAST and PORTABLE!

HERE'S A GAGE that combines PORTABILITY with speed in use and absolute accuracy on dimensions as fine as .0001". STANDARD Dial Snap Gage is portable and easy to handle as a conventional snap gage, yet has the quantitative accuracy of a stationary instrument.

Adjustable gaging pin has a serrated flat surface tipped with tungsten carbide that practically *defies wear*. Opposite movable pin has mushroom top, also tungsten carbide. Point-and-plane construction assures continued, accurate readings whether instrument is set by cylindrical or flat standards.

STANDARD Dial Snap Gages speed inspection, guard against rejects and material spoilage and eliminate human variations not only on precision work but also where tolerances are comparatively liberal. Write for Special Bulletin.



FEATURES

1. High precision indicator approximately 1" in diameter graduated .0001". Bezel rotates for convenient setting.

2. Measuring anvil tipped with tungsten carbide. Indicator protected against shock by sudden applications to measuring pin.

3. Tungsten carbide tipped adjustable anvil has flat lapped serrated surface. Minute chips and dust readily clear from it, helping insure accuracy.

4. Adjustable, spring-cushioned safety stop reduces jar, helps hold work in correct gaging position.

5. Air space between grip and body of instrument protects against hand heat, further safeguards accuracy.

STANDARD GAGE CO., INC., Poughkeepsie, N.Y.

EXCELLENCE OF QUALITY

Holo-Krome Quality is assured by the constant research work of its fastening engineers . . . by the rigid precision inspection of its alert "quality-trained" workers . . . by devoting its entire facilities, exclusively, to the manufacture of Socket Screw Products . . . Excellence of Quality is the logical result . . . HOLO-KROME Guarantees Unfailing PERFORMANCE.

HOLO - KROME

fibro-forged SOCKET SCREWS

THE HOLO-KROME SCREW CORP., HARTFORD 10, CONN., U. S. A.

The TOOL ENGINEER

VOL. XII T.M. REG. U.S. PAT. OFF. No. 3

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R. G. BRAMSON
Business Manager

J. M. KAMBERG
Circulation Manager

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☆

Publisher's Letter

WHILE discussing THE TOOL ENGINEER with friends recently, they seemed to think that publishing a magazine is pretty much the result of some printer's good efforts . . . . . that publishers hand their printers a few articles which the postman brings in, select illustrations, address the mailing wrappers, and—presto—in a week's time a sparkling new issue is on its way to you. This is not intended to disparage the printer's good work, but I think you would be interested in what it takes to put together . . . . .

One Good Article

Securing a good feature technical story seldom commences less than months ahead of the deadline. Weeks before an editor leaves his desk to cover his assignment the wheels must be set in motion. First, we must secure the permission of the management to visit its plant. Since the production is on war work, clearance must be obtained on each article from the army, the navy, maritime commission or the air corps—all with Washington approval. Then we hope the railroads can supply, at the time we need it, necessary transportation accommodations. Our Girl-Friday stands in line for hours (during which time she can't lend a hand with meeting that day's copy deadline) and is glad to get an upper. Finally, our editor must have arranged in advance to finish his work on the current issue—and all of this he had to plan very carefully days in advance. Against a "hitch" in his well-laid plans, he must have another plant, another trip, another clearance all set to keep production going at top speed.

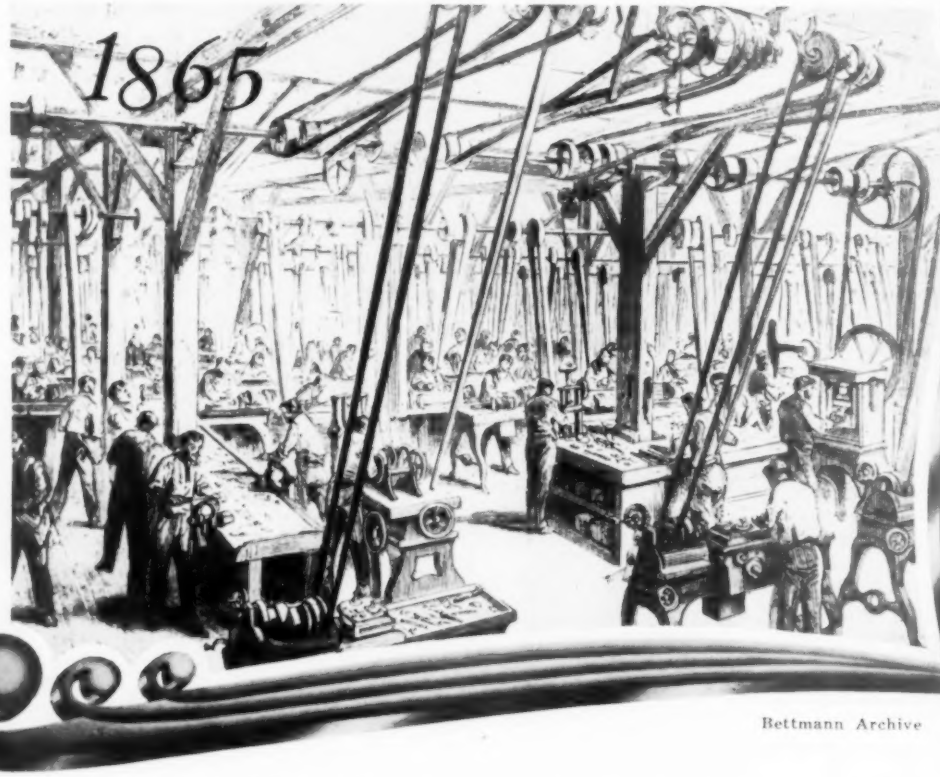
•

Picture the above routine as a continuing procedure month by month and the "flow" of materials in our "shop" becomes more apparent. Knowing where to go for materials, is not—these days—the work of a purchasing agent, as in most plants. Good articles seldom are purchased, but are originated through constant contact with important plants and production men in every part of the country. You don't hop a plane, a bus, or a train without knowing where and why you're going and what you're after. You readers are the real bosses. We want to print what you want—and we like to have you tell us what you want. We'll do a better job for you if you keep us posted.

No, you can't publish a good magazine from the mail bag!

Roy T. Bramson

Just imagine production then



Bettmann Archive

THIS interior factory view is taken from a woodcut of the period around 1865. Suppose this war had to be fought and won with yesterday's production equipment. In those days the line shafts, transmissions and belts fixed the layout of the machines, causing the loss of valuable floor space and adding to the general confusion. Tooling was a slow, tedious process. Work was fed and chucked by hand. Compared by the standards of today, production was negligible. And what was the greatest single improvement over the old methods? Perhaps it was the advancement in the use of air and hydraulics. The applying of air or hydraulic pressure for the operation of chucks, work holding and ejecting devices, stamping and assemblying presses and many other labor saving devices. "*LOGAN*" Air and Hydraulic Equipment has solved production problems and speeded up manufacturing in most of America's largest industrial plants. Let "*LOGAN*" Engineers make recommendations on modernizing the equipment in your plant by the application of Air and Hydraulic equipment.

LOGANSPORT MACHINE, INCORPORATED

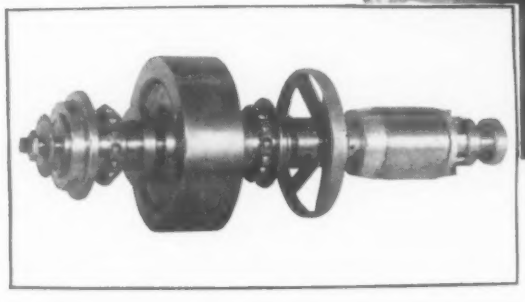
902 PAYSON ROAD LOGANSPORT, INDIANA

Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories

"LOGAN"

THE MILWAUKEE FACE MILL GRINDER GIVES YOU ALL THREE!

1. UNUSUAL RIGIDITY
2. REDUCED SHARPENING TIME
3. ACCURACY TO WITHIN .0002 PER INCH



The three-bearing spindle rotates at 3,400 R.P.M. and carries a heavy flywheel, the inertia of which when in motion successfully keeps the abrasive wheel up to grinding speed. Sharpening time has been considerably reduced as a result.

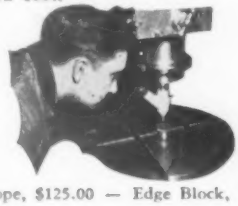
THE basic design of the Milwaukee Face Mill Grinder embodies strength, precision, and capacity. It is capable of sharpening Tungsten Carbide Cutters ranging from 3" to 16" in diameter — grinds the blades to within .0002 per inch.

Set-ups are quickly made with graduated dials, facilitating adjustments. Other controls are handily located for simplified operation.

OTHER IMPORTANT FEATURES:

1. Jeweled bearing dial indicator for accurate checking.
2. Finger tip control.
3. Fine thread precision saddle screw.
4. Hand screw permits angular setting of 15° on either side.
5. No adapters necessary.
6. Spindle has No. 50 National Standard Taper.
7. Blower system at slight extra cost.

Reject the Source of the Error . . . not the Finished Product . . . USE CENTER SCOPE!



The Center Scope is an optical locating machine shop tool, constructed for use on any machine from jig borers to bench drills. No technical knowledge or training is needed to use it. It is a necessary production tool — necessary today because you are interested in saving time — tomorrow, because you will be interested in saving cost.

Built in various models; variable and rotating Center Scope priced at $97.00, with taper shank, $125.00; Special Center Scope, $125.00 — Edge Block, $23.00 additional.

Write Department CS, for complete information.

KEARNEY & TRECKER PRODUCTS CORPORATION • *Milwaukee, Wisconsin*

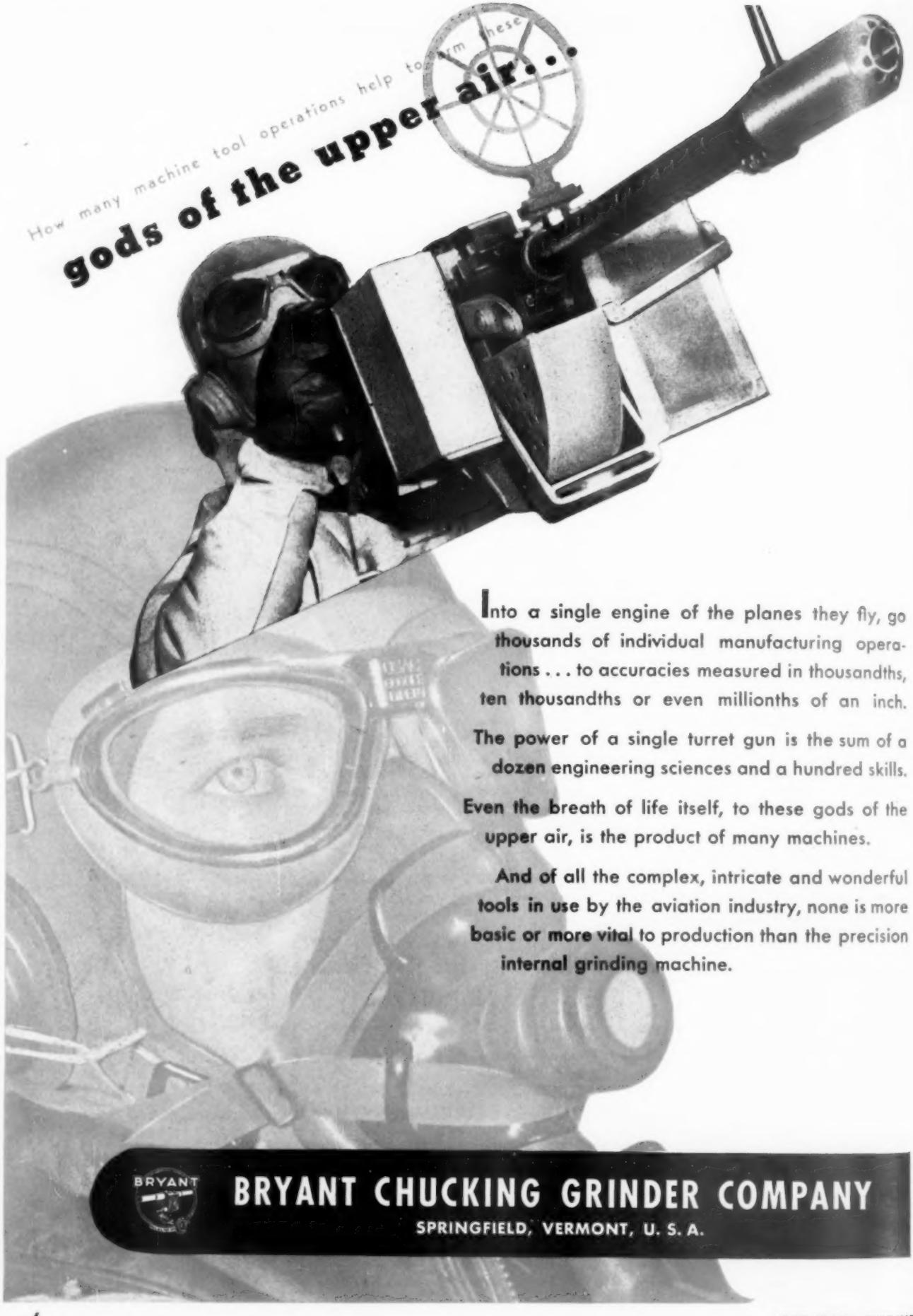
Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker Products CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

How many machine tool operations help to form these

gods of the upper air. . .



Into a single engine of the planes they fly, go thousands of individual manufacturing operations . . . to accuracies measured in thousandths, ten thousandths or even millionths of an inch.

The power of a single turret gun is the sum of a dozen engineering sciences and a hundred skills.

Even the breath of life itself, to these gods of the upper air, is the product of many machines.

And of all the complex, intricate and wonderful tools in use by the aviation industry, none is more basic or more vital to production than the precision internal grinding machine.

BRYANT

BRYANT CHUCKING GRINDER COMPANY

SPRINGFIELD, VERMONT, U. S. A.

EX-CELL-O CYLINDER BORING MACHINE

To left: Ex-Cell-O angular type machine equipped with six spindles to finish bore valve seats and valve guide holes in cylinder head of aircraft engine on a production basis. Each spindle is individually adjustable for depth of cut, as are the tools in the boring bars (boring bars, not shown in picture, are piloted in the fixture).

SPECIAL MACHINES

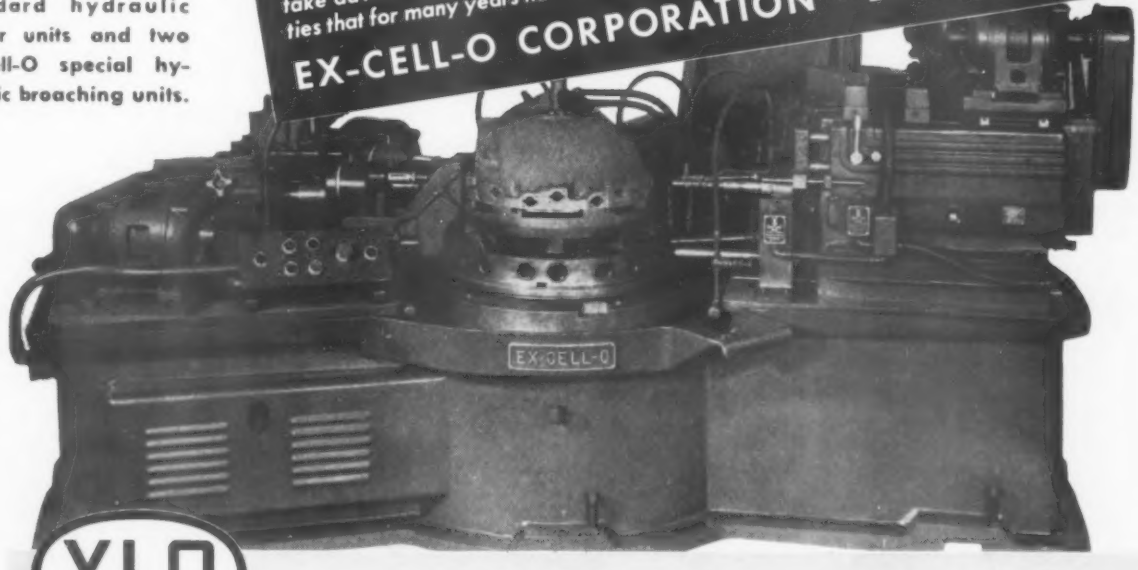
...for today's production... and tomorrow's

For years Ex-Cell-O has been familiarly known as "the headquarters" for special single-purpose machines for turning out accurate parts at a high rate of speed . . . machines that frequently perform numerous operations in one setting of the work and often bring not only a substantial increase in the number of parts produced hourly but also improved quality and reduced unit cost. . . . This is why so many manufacturers have turned to Ex-Cell-O for equipment to meet their war production schedules; why Ex-Cell-O designed machines will figure in the postwar plans of an increasing number of American industries. . . . If you are planning for tomorrow, when the new standards will necessitate costs that are competitive, take advantage of the wide engineering experience and extensive manufacturing facilities that for many years have made Ex-Cell-O a leader in the precision machine tool field.

EX-CELL-O CORPORATION • DETROIT, MICH.

EX-CELL-O SIX-WAY MACHINE

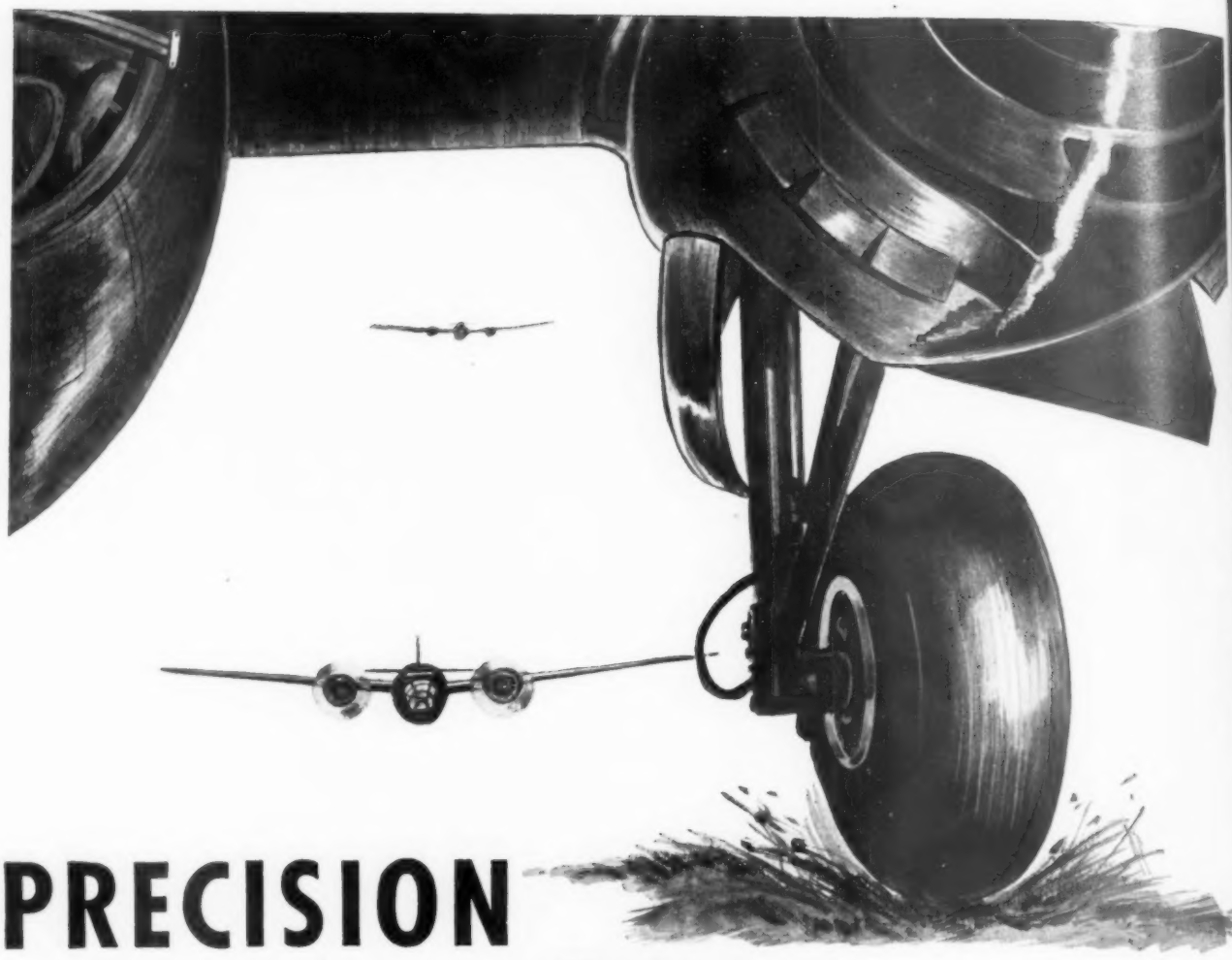
Below: Ex-Cell-O six-way machine for drilling, broaching and reaming valve guide holes in a magnesium crankcase. This machine is equipped with four standard hydraulic power units and two Ex-Cell-O special hydraulic broaching units.



XLO

EX-CELL-O *for* PRECISION

Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

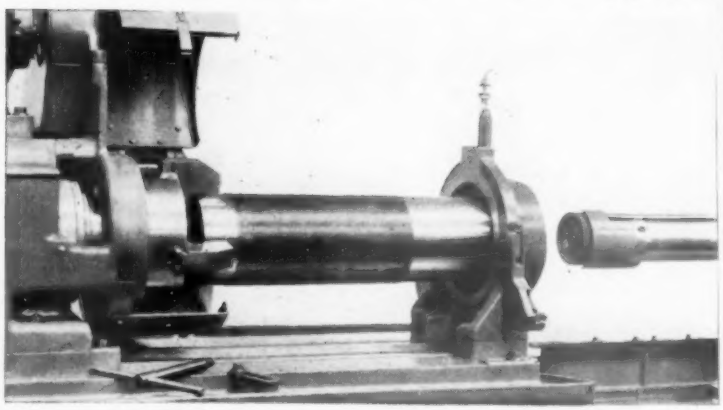


PRECISION

takes the bounce out of Rough Landings

Setting a giant war bird down without a bounce calls for a skillful job of piloting . . . calls for precision manufacture of all landing gear components, too.

By grinding many of the parts on Heald Automatic Grinders, aircraft manufacturers get extreme accuracy in every component. Accuracy that enables the landing gear to cushion the shock of the roughest landing.



Shown above is a Heald No. 74 Extended Bridge Internal grinding big aircraft strut cylinders. A bore 6" I.D. x 31½" long is ground in these struts. Strut is held at one end by a four-jaw chuck attached to the workhead and at the other end by a steadyrest, both workhead and steadyrest being mounted on the extended bridge.

However, this is but one of the many Heald precision grinding and boring applications. In the aircraft industry alone, you will find hundreds of Healds boring, grinding, turning, grooving, forming, milling, and facing aeroplane components to the closest tolerances at mass production speeds.

Heald Engineers will gladly help you with your precision grinding and boring jobs. Ask for their services, today.

THE HEALD MACHINE CO., Worcester, Mass., U.S.A.

For More Precision Faster, bring your problems to Heald

Throw a needle through a Haystack?

Oilgear Fluid Power has solved more difficult problems

IT may sound foolish to talk about throwing a needle through anything . . . but Oilgear Fluid Power furnished just the right answer to *that* problem in the design of wire-braiding machines. Oilgear provided a mechanism that could rapidly reciprocate the necessary machine part without it tearing everything to pieces as previous constructions had always done.

Your machine design problem may be quite different. You may want steplessly variable speed control of some function . . . or a simple means of applying great pressure . . . or a way of synchronizing a group of motions . . . or a perfect sequence or cycle operation . . . or any one of dozens of Oilgear answers to problems that appear virtually impossible—*until you know Oilgear Fluid Power.*

For a quarter century Oilgear engineers have worked with executives and designers of hundreds of companies building machines and mechanisms of widely diversified use. The combination of Oilgear experience and know-how with the remarkable possibilities inherent in Oilgear Fluid Power equipment may be the very answer to *your* long-sought perfected machine. *Now* is the time to find out. The Oilgear Company, 1568 W. Bruce Street, Milwaukee, Wisconsin.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R P M or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

Fluid Power

MORE* PRODUCTION

FROM PLANERS...

*(Increase varies with type of production.)

with ROTOTROL and Westinghouse VARIABLE VOLTAGE DRIVES

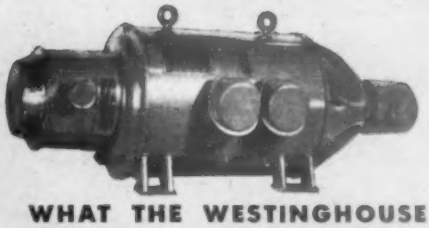
"In our opinion, for equivalent planer construction, a minimum increase in production of 15% can be expected by using a Westinghouse Variable Voltage Drive."

This statement by the general manager of a plant equipped with Westinghouse Planer Drives is more than verified by other users' experiences. Faster return speeds and more accurate stopping are made possible by Westinghouse ROTOTROL—a control method that permits faster acceleration and deceleration, and holds the planer motor speed constant over the entire speed range. As a result, MORE cutting strokes per minute are obtained.

At the same time, machine outages for maintenance of controls are reduced, because the Westinghouse Variable Voltage Drive requires less than half the usual number of contactors, relays and interlocks used on older types of drives, and involves almost 2/3 fewer electrical operations per planer stroke.

Get the full story on this faster, more flexible, proved planer drive. Check your Westinghouse representative today or write Westinghouse Electric & Manufacturing Co.

J-21203



WHAT THE WESTINGHOUSE VARIABLE VOLTAGE PLANER DRIVE DOES

- **Gives more cutting strokes per minute.** Faster acceleration and deceleration. Speeds reversing time.
- **Reverses accurately to a line**—provides accurate control for planing up to shoulders or in blind pockets.
- **Provides closely regulated speed** at any setting over entire range, regardless of voltage or load fluctuations.
- **Cuts machine outages** for control maintenance.

Westinghouse

VARIABLE VOLTAGE DRIVES

PRODUCTION INSPECTION BY OPTICAL PROJECTION

Some of the many and varied parts inspected by Jones & Lamson Optical Comparators.

Comparison Inspection of production parts and products with **Jones & Lamson Optical Comparators** sets new standards for speed and accuracy in production inspection.

The most complex forms can be inspected with a rapidity and precision unobtainable by other methods, by operators with a minimum of training or experience.

There is a **Jones & Lamson Optical Comparator** for every need in the field of inspection by optical projection, and our inspection engineers are ready to study your inspection problems and make recommendations based upon more than twenty years experience in this field.

Photo courtesy The Eastern Machine Screw Corporation.

Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Threading Dies

JONES & LAMSON MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.

Profit-producing Machine Tools

"MORE PRODUCTION, BETTER FINISH, REJECTS ELIMINATED—Grinding Airplane Cylinder Valve Seats"

writes
POR-OS-WAY'S
WAR PLANT
REPORTER

Dear Charlie:

I'm writing this from the [redacted] plant, and here's more bad news for the Axis.

The use of Por-os-way is producing one additional airplane barrel, with valve seats precision-ground, every working hour. Multiply that one out, and you can see that Por-os-way's got something — something that the Axis doesn't like.

So long 'til next report
Your roving reporter
"Vic"

THE JOB:
Removing .010" to .012" from valve seats of airplane cylinder barrels on a Waddell Valve Seat Grinder—wet grinding at 5,000 R.P.M.

THE WHEEL:
Por-os-way 3¼" x ⅜" x 1⅛" C80 HV3.

All facts and figures given are taken from an actual field survey made by a Por-os-way correspondent.

WRITE for complete booklet "Facts About Por-os-way". The address is 462 Wheatland St., Phoenixville, Pennsylvania.

THE RECORD	POR-OS-WAY	FORMER WHEEL
Pcs. per Hour (2 Seats per Cylinder Barrel)	5*	4
Dressings	None	3 per wheel
Pcs. Per Wheel	300-375	120-150
Life of Wheel	1½ days	1 day
Average Depth of Cut	.005"—.008"	.001"—.003"
Rejects	None	2%
Finish	Superior	———

*Conservative. Por-os-way has proved ability to grind 8 pcs. per hour, or 100% more than former wheel.

Remarks (by foreman). "My men take pride in their work. If a wheel is too hard and burns work, it means lost time and material and gets them sore. We are sold on the merits of Por-os-way."

2 TO 5 TIMES MORE WAR PRODUCTION PER MAN PER MACHINE

POR-OS-WAY*
a new
RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.
COPYRIGHT, 1943, A. P. de Sanno & Son, Inc.

Speed WAR PRODUCTION TRAINING

USE THESE BOOKS AND FILMS ON LATHE OPERATION

One of the most serious problems confronting management today is the training of new employees to replace thousands of skilled technicians who have been called for service with the armed forces. With inexperienced workers, production goals must be increased and standards of precision and quality must be maintained. To accomplish this, a vast army of men and women must acquire new skills in the shortest possible time.

To help you train new lathe operators, we offer the practical aids listed below. These books and films on lathe operation have proved effective in hundreds of apprentice training schools, including Army and Navy training stations.

Write for Information on These Practical Training Helps

MOTION PICTURES—"The Lathe" and "Plain Turning"—two 16 mm sound films in color on lathe operation. Available on a free loan basis for apprentice training. Showing time 20 minutes each. Write for circular.

HOW TO GET THE MOST OUT OF YOUR LATHE—Specialized service bulletins on the care and operation of engine lathes. H-1, "Keep Your Lathe Clean"; H-2, "Oiling the Lathe"; H-3, "Installing and Leveling the Lathe"; H-4, "Keep Your Lathe in Trim." Sample copies mailed on request.

HOW TO RUN A LATHE—A practical 128-page operator's handbook. 360 illustrations. Written in simple, non-technical style easy for the beginner to understand. Used as a shop text book by the Army, Navy and Air Corps. Price 25c. Sample copy free to apprentice supervisors.

THREAD CUTTING—21-page book, "How to Cut Screw Threads in the Lathe." Shows how to set up a lathe for cutting various pitches of screw threads; setting cutter bits; screw thread formulae; metric threads, etc. Price 10c. Sample copy free to apprentice supervisors.

GRINDING CUTTER BITS—12-page book on grinding lathe tool cutter bits. Covers identification and application of various bits, methods of grinding, correct angles, etc. Price 10c. Sample copy free to apprentice supervisors.

ARMY E NAVY

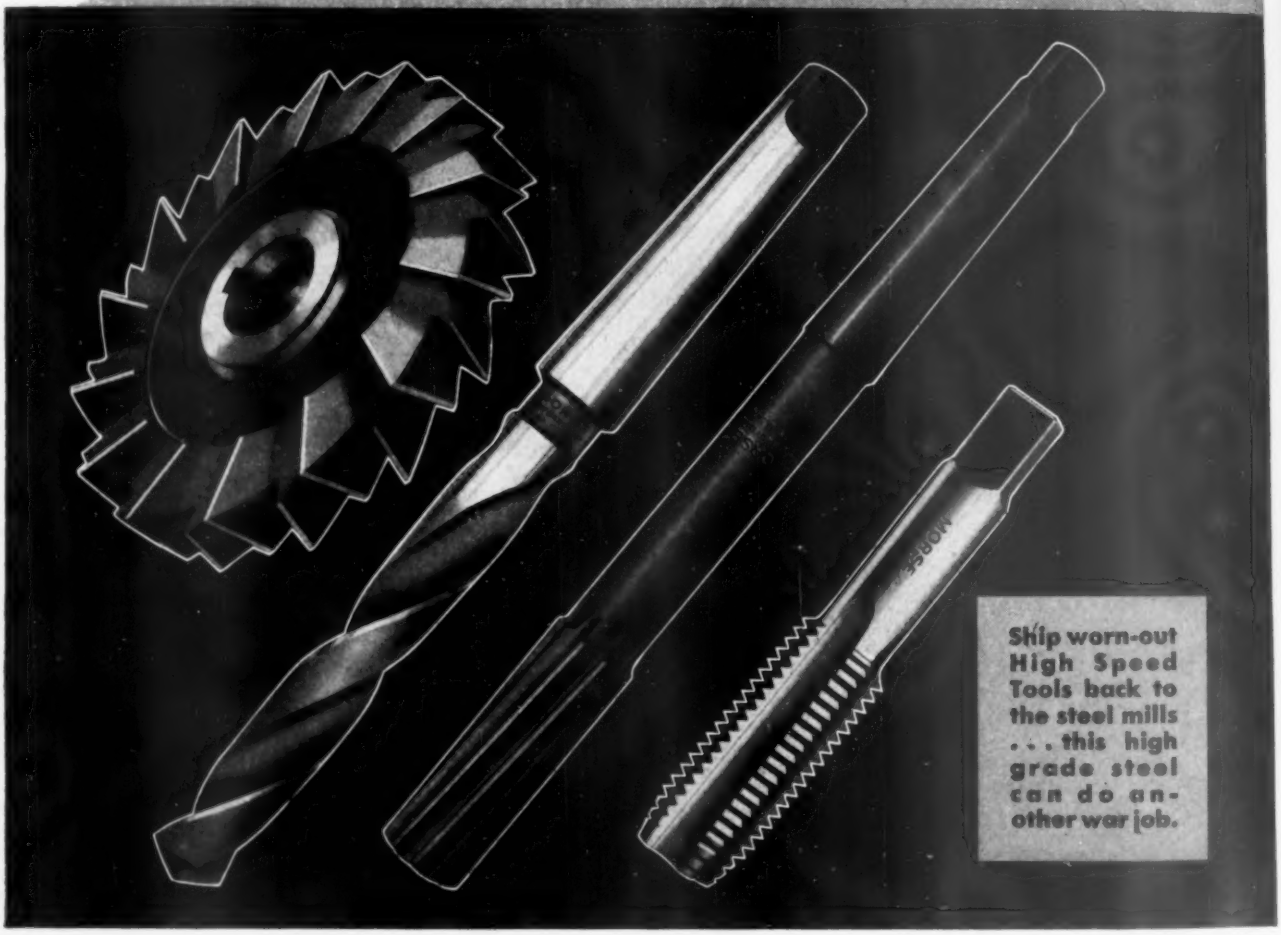
SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 36 YEARS — SOUTH BEND, INDIANA

TRADE MARK SOUTH BEND TWINS ENGINE LATHES

TOOLS MUST BE ABLE TO TAKE IT, TOO!

• Only quality cutting tools have the stamina to stand up under today's heavy production schedules. Use MORSE Tools — tools that can take it!



Ship worn-out High Speed Tools back to the steel mills . . . this high grade steel can do another war job.

MORSE THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. • • • • CHICAGO STORE: 570 WEST RANDOLPH ST.

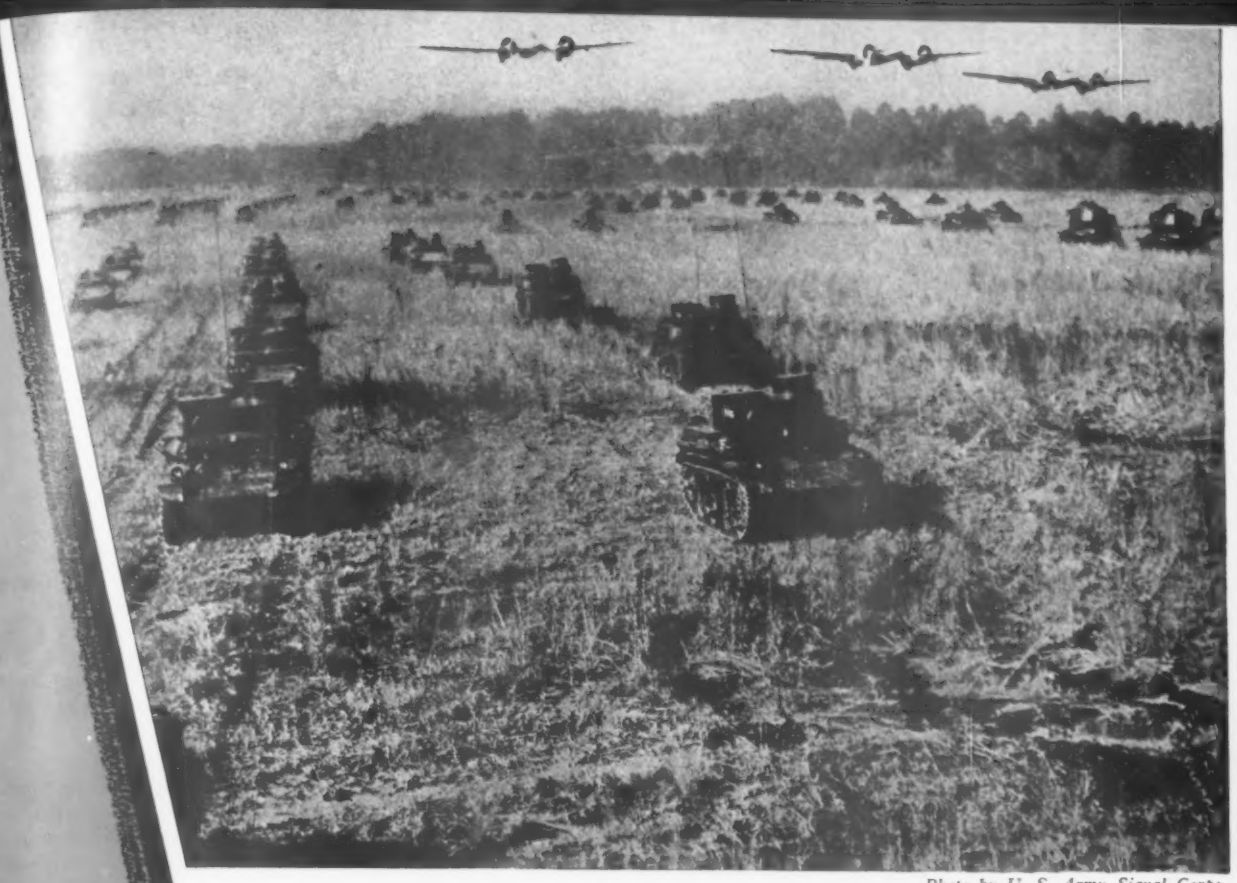


Photo by U. S. Army Signal Corps.

Less time per piece...and more pieces per machine...with

P&J *Automatic* CHUCKING EQUIPMENT

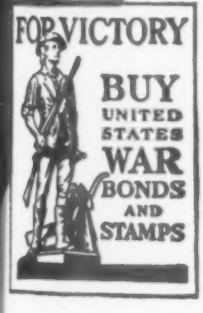
Speed up in munitions production to heights never before attained has been the answer to the call for "more." More planes, tanks, engines, guns and a host of other equipment are leaving production lines because essential parts for these vital weapons are being turned out to exacting specifications "on schedule."

Duplicate parts machined on P&J equipment are contributing much to this speed up because their accuracy and finish are such as to facilitate and simplify assembly operations. Capacity, power, speed and tooling make it possible for P&J machines in war production plants to maintain the constant flow of quality parts to assembly lines.

A further expansion in parts production will find P&J ready, as always, to carry its full share of the load.

The POTTER & JOHNSTON MACHINE CO.

Pawtucket, R. I.



There are plenty of war jobs . . . for war plants to do with your help

BUY MORE WAR BONDS

How Sundstrand Engineers Use Rigidmils To Meet *Special* Milling Requirements

A Typical Example of Engineered Production on Small Blade Parts

Perhaps your difficult milling problem can be solved by standard milling machines tooled up to suit the job. Or, it may require a strictly new milling machine design. In either case a thorough study of the job by Sundstrand Engineers will result in an economical productive solution. Here's how they solved one of many special milling jobs.

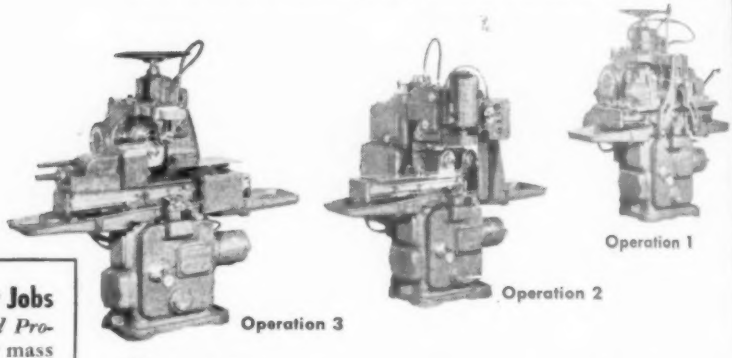
Machine Tooled to Suit Required Operations . . .

This intricate blade part is machined from a tough steel forging. The part is small, tough and of an irregular shape, adding to the difficulty of holding while machining.

TOOLING

1. ***First Operation*** **. . .** Straddle mill both sides. By furnishing "automatic spindle reverse" a "2 way" table cycle could be used and production was increased from 65 to 120 pieces per hour. Furnishing the machine with "automatic spindle reverse" permitted "down cut" milling at both ends of the table. Thus the fixture designs are similar, the cutting action on all parts alike, and the resultant finish and accuracy of the parts more uniform.

2. ***Second Operation*** **. . .** Forming radius and neck on one end of the piece while sizing to length and width on the other end. Form milling cutters on parallel spindles are used for forming the radius and neck. The radius in relation to the neck is held within .00025". The sizing operation is accomplished with a combination of two half side milling cutters and a plain milling cutter all on a vertical spindle located on the opposite side of the work holding fixture. Work was formerly done in *two* operations at a production of 40 pieces per operation per machine. This Rigidmil combines two operations on one machine at a production of 50 pieces per hour.



3. ***Third Operation*** **. . .** Milling the angular and curved surface on the back. Work requires an extremely high finish, as any scratches or tool marks will cause rejection. A No. 1 Hydraulic Rigidmil with an ingenious special roll-over fixture provides a complete automatic milling cycle for this difficult operation. Production was increased from 34 to 70 pieces per hour over the former method of machining.

Only Three Rigidmils Used . . .

Through unusual fixture design and tooling, only three hydraulic Rigidmils were required for these operations. Machines for operations Nos. 1 and 3 are standard Sundstrand No. 1 Rigidmils tooled to suit the operations. Operation No. 2 is solved with a No. 1 Rigidmil equipped with a special three-spindle head and fixtures to suit the job.

How Sundstrand Engineers Can Help You on Similar Jobs

This is one of many examples of Sundstrand *Engineered Production.* No matter if your requirements are long-run for mass production or short-run for miscellaneous manufacturing, it will pay you to consult our Engineers. Use this service freely. Send complete accurate information on your requirements with each inquiry.

Get These Free Booklets . . .

These interesting bulletins cover the Sundstrand No. 00, No. 0 and the No. 1 Rigidmils. Get the complete information on this versatile line of milling machines. Write for Bulletin 816.

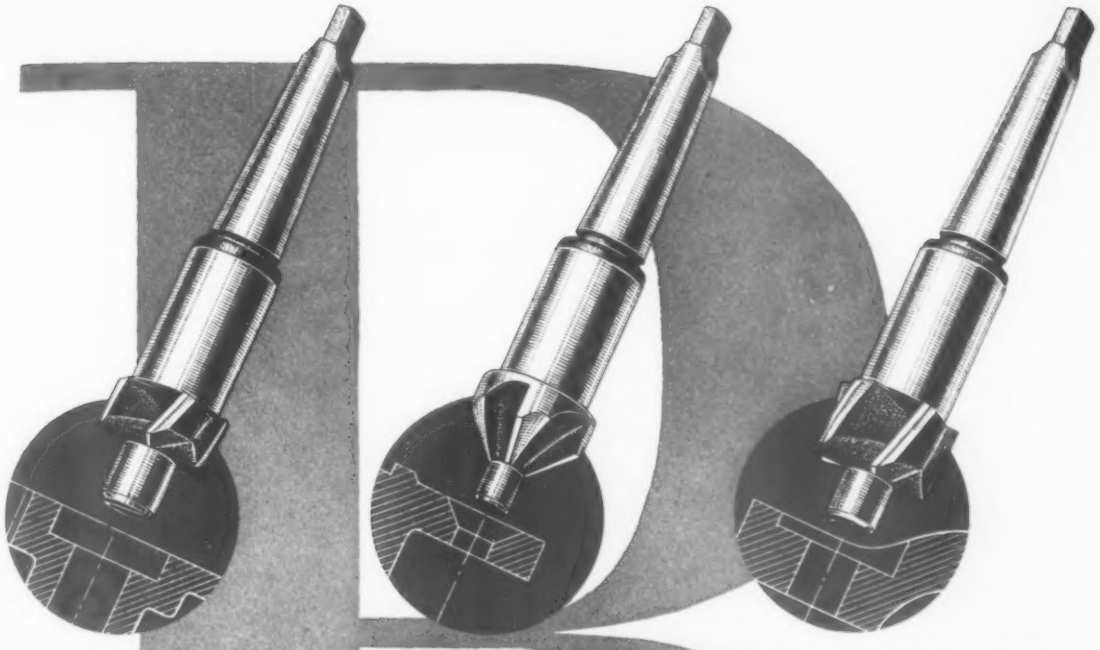
SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

ARMY NAVY

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2532 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.



Rx PRESCRIPTION FOR THE TOOL ROOM:

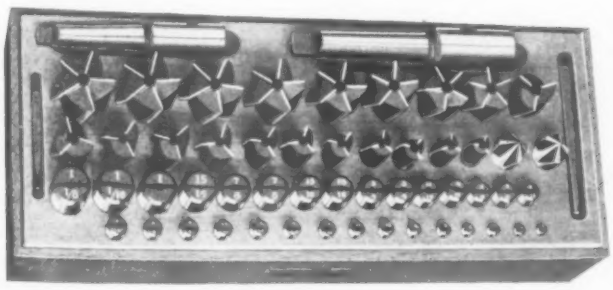
Gairing Interchangeable Counterbore Sets

In tool rooms, machine, die and repair shops, Gairing **Interchangeable** Counterbore Sets provide the proper prescription for all counterboring, countersinking and spot-facing operations. They are adaptable, dependable friends, good medicine neatly boxed in sturdy wooden cases with stout hinged covers.

There are seven sets from which to choose. Set C-13 is illustrated here. Each contains a logical assortment of **interchangeable** counterbores, countersinks, pilots and holders. Every tool in every set is designed with special features to meet a wide variety of requirements.

The **interchangeable** holders in these sets are of Morse Taper or straight shank type (optional). Threaded shank pilots are of selected alloy steel hardened and ground on the head. Shanks are drawn and treated to obtain unusual toughness and strength. High speed steel counterbores are renewable. All counterbores, pilots and holders selected are standard items of the most active sizes used. Replacements may be quickly obtained from stock.

The use of these interchangeable assemblies assures large savings over the old-fashioned solid integral pilot type.



Gairing Interchangeable Counterbore Set No. C-13, that provides two hundred and eighty-one various combinations of pilots and cutters, interchangeable in two holders for counterboring and spot-facing holes from $\frac{9}{32}$" to $1\frac{1}{8}$" inclusive. Counterbore sizes range from $\frac{9}{16}$" to $1\frac{3}{4}$". **Six other sets are available with smaller and larger tools.**

GAIRING
FOR OVER A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS
gairing TOOLS

Write us today for our four-page Counterbore Bulletin illustrating, describing and pricing all seven sets.

THE GAIRING TOOL COMPANY, Detroit 32, Michigan

Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools

HATS OFF TO AMERICAN WOMEN!

THEY, TOO, ARE DOING JOBS NEVER THOUGHT POSSIBLE!

★ In this war, as in World War 1, American women are answering Uncle Sam's call to fill the ranks in Industry as more and more men are enlisted in our armed forces. With alert minds and nimble fingers, thousands of American women are performing their tasks on machines and assembly lines with a fine sense of loyalty and patriotism. And they are doing their work well . . . work that in many cases calls for unusual mechanical ability.

For example . . . here are women operating a battery of Greenlee 6-Spindle Automatics in the Detroit plant of the Ex-Cell-O Corporation. They are operating these accurate, high-production machines entirely satisfactorily. Yes . . . women, too, are doing jobs never thought possible.

And What About the Job of Training New Operators?

When it comes to Screw Machines, training new operators is never a quick or easy task, but there are many advantages offered today in machine designs that shorten the training period . . . make possible the use of women operators. For instance, here are a few of the mechanical improvements found in Greenlee Automatics that greatly aid and simplify the task.

1 ***The wide-open tooling area on the Greenlee*** provides easy access to working tools with more elbow room for changing set-ups. Low, convenient height of machine affords a clearer view, at floor level, of the various working parts, and reduces physical strain on operators.

2 ***No camming is required on main tool slide,*** and adjustments are simple. Exact settings for tool slide stroke are quickly made by means of an adjustable dog located on a graduated worm wheel. A scale on each side of tool slide is provided to keep check on stroke while machine is in operation.

3 ***Cross Slides are independently operated with*** separate cams . . . permits better tooling set-ups . . . increases production. Cams are interchangeable and eliminate special camming for each job. They are quickly and easily changed and save set-up time.

4 ***A wide range of speeds and feeds*** for production and economy are provided, any of which are easily obtained by changing multi-splined pick-off gears. On machine with chucking capacity for 1⅝" O. D. stock, spindle speeds range from 105 to 2625 R. P. M. with a feed range for .0017 to .0388.

Greenlee Engineers stand ready and willing to assist you with any of your Screw Machine Problems. *Engineering surveys will be gladly rendered without obligation.*

★ ★ ★ **GREENLEE BROS. AND CO.** ★ ★ ★

1949 MASON AVE. • ROCKFORD, ILLINOIS

GREENLEE *Automatic Screw Machines*

"This is a Grinding War . . ."

Copyright 1892 and 1920 by Harper & Bros.

FIGHTING TOP-

A terror in its day was the Gatling gun, shown here in the fighting top of an 1892 battleship. It was good as guns went then, when there was no such thing as production grinding, but modern weapons leave it far behind.

How did our fighting equipment make such progress in so few years.

Give a pat on the back to those who dreamed up the new designs—and to the far-seeing men who spark-plugged research in years of peace as well as war. Much credit, however, for the development of our precision ordnance must go to American mass production methods. But without grinding methods and processes, mass production as we know it could not exist.

Take the modern anti-aircraft gun. Every moving part must be ground to split-hair precision. It is this precision which enables the gun to fire with such deadly accuracy, so rapidly and so continuously.

And this goes for every other piece of fighting equipment, too. Every moving part in the engines which carry a plane, tank, truck, jeep, sub or ship into battle must be ground to closest tolerances.

Grinding is on the job even before production of these weapons begins.

The cutters, reamers, drills and broaches of machine tools that *make* machines of war must also be ground to close limits.

Carborundum has helped to develop many modern grinding processes in the past. And today, because "this is a grinding war," our engineers, research men—*all* of the men and women of Carborundum are working with redoubled energy.

Their contribution to the war effort received official recognition when the men and women of Carborundum were recently awarded the Army-Navy "E" Production Award. And they stand ready to make a similar contribution toward a better world of peace.

* * *

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. So please remember that grinding wheels, too, are "Weapons for Production" . . . use them wisely to help end the war sooner.

The Carborundum Company, Niagara Falls, New York.

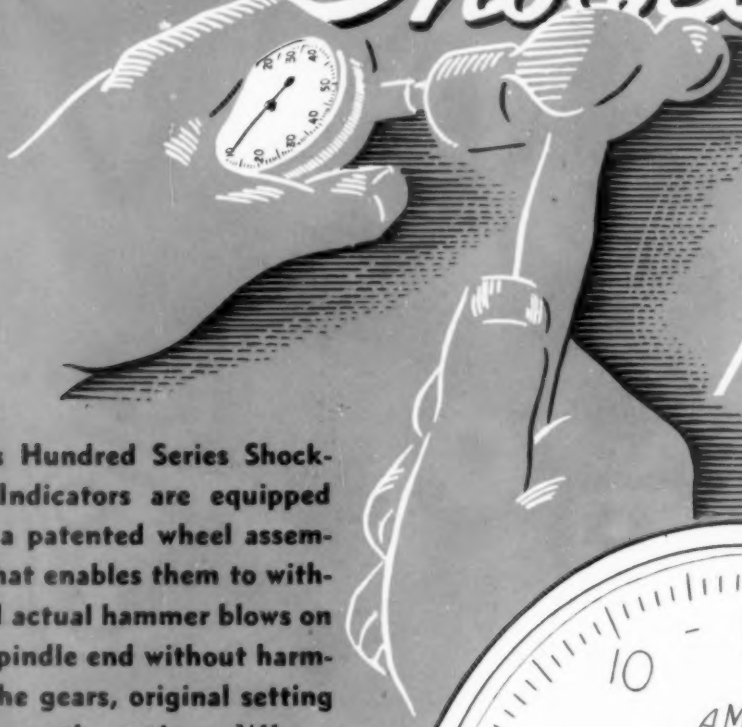
THE CARBORUNDUM COMPANY

CARBORUNDUM AND ALOXITE ARE REGISTERED TRADE-MARKS OF AND INDICATE MANUFACTURE BY THE CARBORUNDUM COMPANY

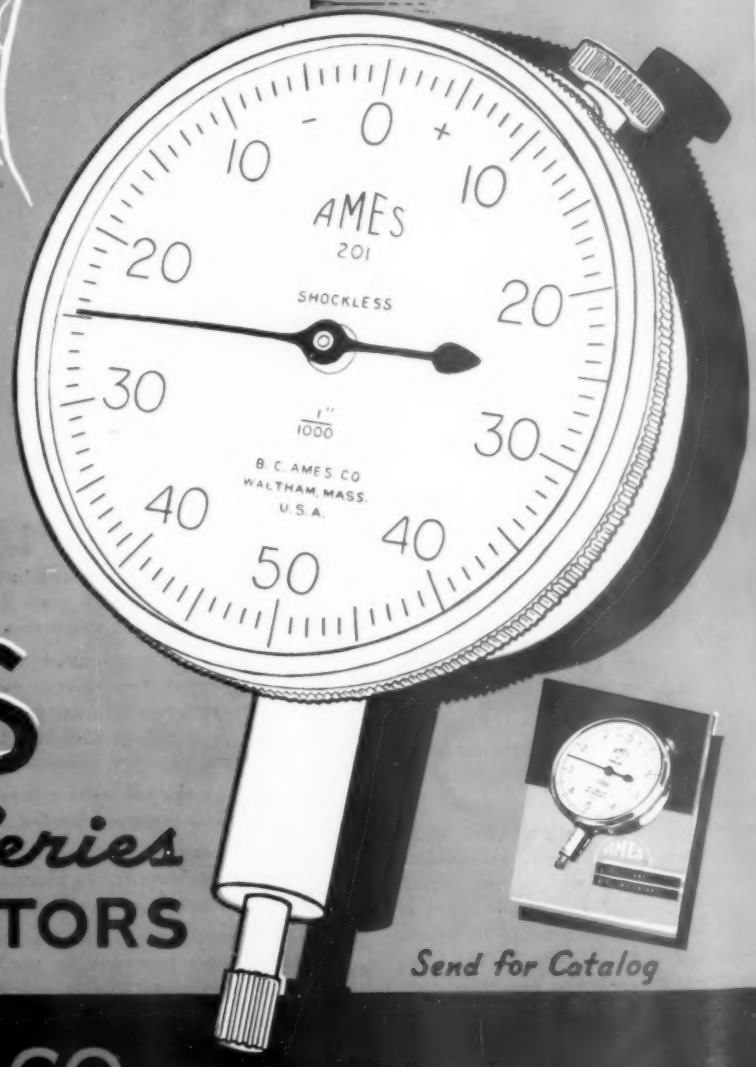
Shockless

in

4 Sizes
14 Dials



Ames Hundred Series Shockless Indicators are equipped with a patented wheel assembly that enables them to withstand actual hammer blows on the spindle end without harming the gears, original setting or smooth action. Where shocks or jolts occur in testing or rough and careless handling ruin other indicators, Ames Shockless Indicators give long, satisfactory service at substantial savings.



AMES

Hundred Series
DIAL INDICATORS

Send for Catalog

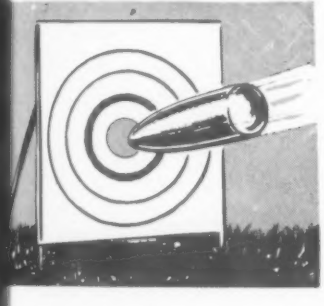
B.C. AMES CO., WALTHAM, MASS., U.S.A.

Cutting oil *News* letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs.

SEPTEMBER, 1943

y on . . . easy off . . . and no ! Rust trouble nagged a midwest erator, sub-contracting on malleable iron fuse adapters for 5" explosive lls. After the last machining, parts e blast-cleaned and packed for de- ery to a nearby plant, where two ks sometimes elapsed before they e needed. That's when rust got in "licks," and some of the parts re- ired refinishing. It was not consid- d practical to use heavy type anti- products because of the expense trouble in removing them. After tandard Oil Engineer recommended perla Soluble Oil, all trouble disap- ared. The pieces were dipped in a mix of water and Superla at 120- 0° F., and allowed to drain in bask- before packing. Advantages: low t of application, ease of handling, rust.



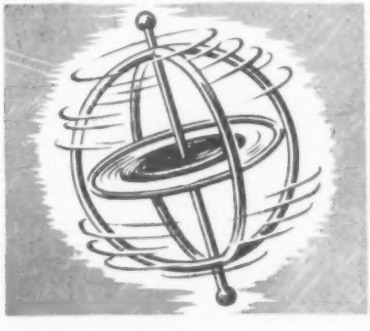
ght on the nose. A northwest cart- ge maker is now delivering a prod- t with better firing accuracy as a ult of switching from high melting nt wax to a special formula com- und for application as a lubricant the bullet or nose end. This is the y product the plant has found that l not run back into the powder en the cartridges are stored.

verheating and tolerance prob- ms solved. A St. Louis manufacturer s getting overheating and tool burn- ing in drilling a 1¼" bar of 18-8 stainless steel to secure a 1/32" wall. A Standard Oil Engineer recommended a 1-5 mix of Stanicool HD Soluble Oil, and the trouble was ended. 50% production losses were eliminated, and

the number of operations was reduced.

The same product, in identical proportion, was used in this plant to secure tolerances of 0.001" in all four dimensions, in machining an end bearing from cold rolled steel. If you have cutting problems that require a combination of long tool life and exceptional cooling, it will probably pay you to investigate Stanicool.

All metals look alike. A Wisconsin manufacturer finds Stanicut 107BC an "all-round champ." Machining gyro-



scope parts with a wide range of both ferrous and non-ferrous metals, this operator uses Stanicut on all of them, gets good finish and tool life on the steel jobs, and no tarnishing on the bronze or brass ones.

Handles variable composition in metal handily. Variations in the heats of X-1335 steel caused a Wisconsin plant much grief in tapping both the bowtail and nose-ends of 40 mm. shells. In fact, seventeen oils were tested before the answer was found. The eighteenth and last oil was recommended by a Standard Oil Engineer—Stanicut 309 BCS for the difficult heats, and the same oil, thinned with 25% Mineral Seal Oil, for ordinary heats. This turned the trick.

Help in honing. In a honing job which removes .009" to .014" from 6-inch sleeves, an Indiana plant secured improved finish without additional operations—using 60% Stanisol and 40% Acme Base Oil Extra Heavy.

Oil is ammunition . . .

Use it wisely

When you bump up against special cutting oil problems

If you are running into trouble in handling war work, and find it tough to get the necessary accuracy, finish, and tool life on converted machines . . . or if you have other perplexing machining jobs that a more efficient application of cutting oils may help answer . . . call in a Standard Cutting Oil Specialist. Phone or write Standard Oil Company (Indiana) office, or 910 S. Michigan Ave., Chicago 5, Ill., for the Engineer nearest you. In Nebraska, contact any Standard Oil Company of Nebraska office.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

NG. . . LUBRICATION ENGINEERING. . . LUBRICATION ENGINEERING. . . LUBRICATION ENGINEERING. . . LUBR

Thanks to the

SUNNEN PRECISION HONING MACHINE

GIRLS IN 'TEENS

are handling jobs in "tenths"!

Aluminum Aircraft Link "produces high finish without bell-mouthing."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

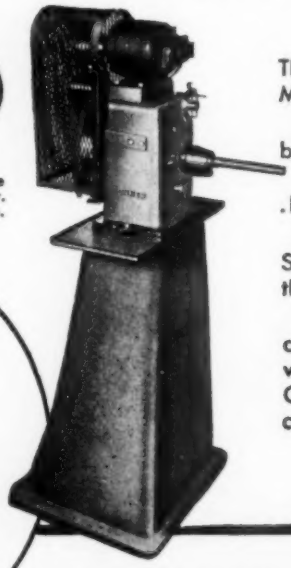
Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Aircraft Valve Tappet Roller. 4-Micro finish.

and what's more remarkable, they can be trained for such accurate work in a few hours.

That's only one reason manufacturers of combat equipment and munitions have adopted the SUNNEN Precision Honing Machine.

The guaranteed accuracy (.0001") and super-smooth finish (2 to 3 micro inches) assure fewer rejects and interchangeability of parts. These advantages not only speed production, but prevent waste of vital war materials.



Low in Cost—Economical to Operate

The basic price of the Sunnen Precision Honing Machine is only $195! And it's economical to operate.

No jigs or fixtures—work is held in hands. Relieves big internal grinders for other jobs.

Wide range—handles any internal diameter from .185" to 2.625".

Protect your previous operations by using the Sunnen method for that most important operation—the last one.

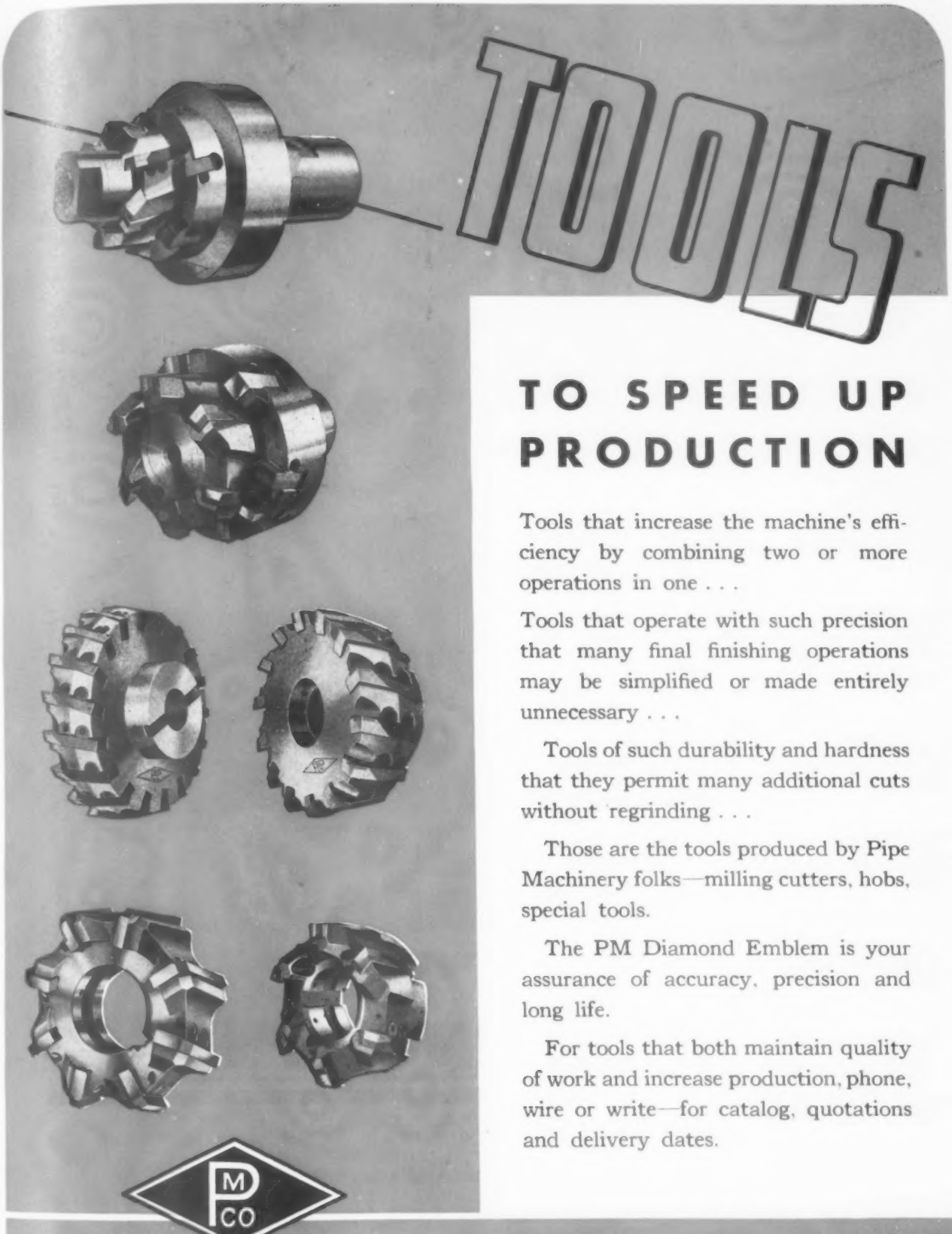
It's easy to find out just what Sunnen equipment can do for you on your job—one of our engineers will be glad to call and help you solve your problems. Or—if you prefer—write for free bulletin giving complete information.

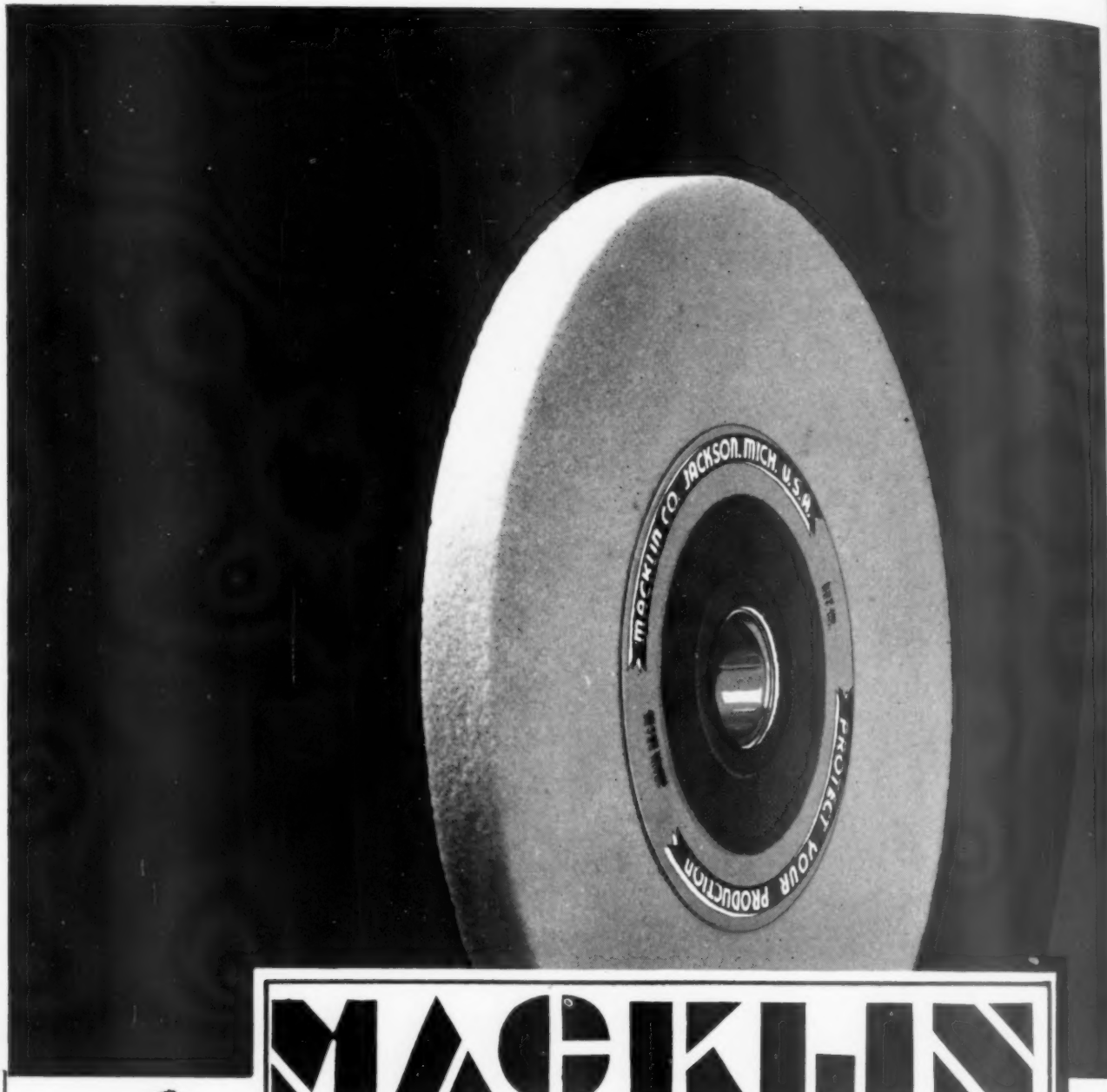
The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

SUNNEN PRODUCTS COMPANY, 7932 Manchester Ave., St. Louis, Mo.

Canadian Factory: Chatham, Ontario


TOOLS
TO SPEED UP PRODUCTION
Tools that increase the machine's efficiency by combining two or more operations in one . . .
Tools that operate with such precision that many final finishing operations may be simplified or made entirely unnecessary . . .
Tools of such durability and hardness that they permit many additional cuts without regrinding . . .
Those are the tools produced by Pipe Machinery folks—milling cutters, hobs, special tools.
The PM Diamond Emblem is your assurance of accuracy, precision and long life.
For tools that both maintain quality of work and increase production, phone, wire or write—for catalog, quotations and delivery dates.
PM CO
The PIPE MACHINERY COMPANY Cleveland, O.
GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS



MACKLIN

GRINDING WHEELS

This FREE 64-page book still available. Write for your copies.

MACKLIN Wheels are made in all sizes and shapes in all grain and grade combinations to *"Protect Your Production."*

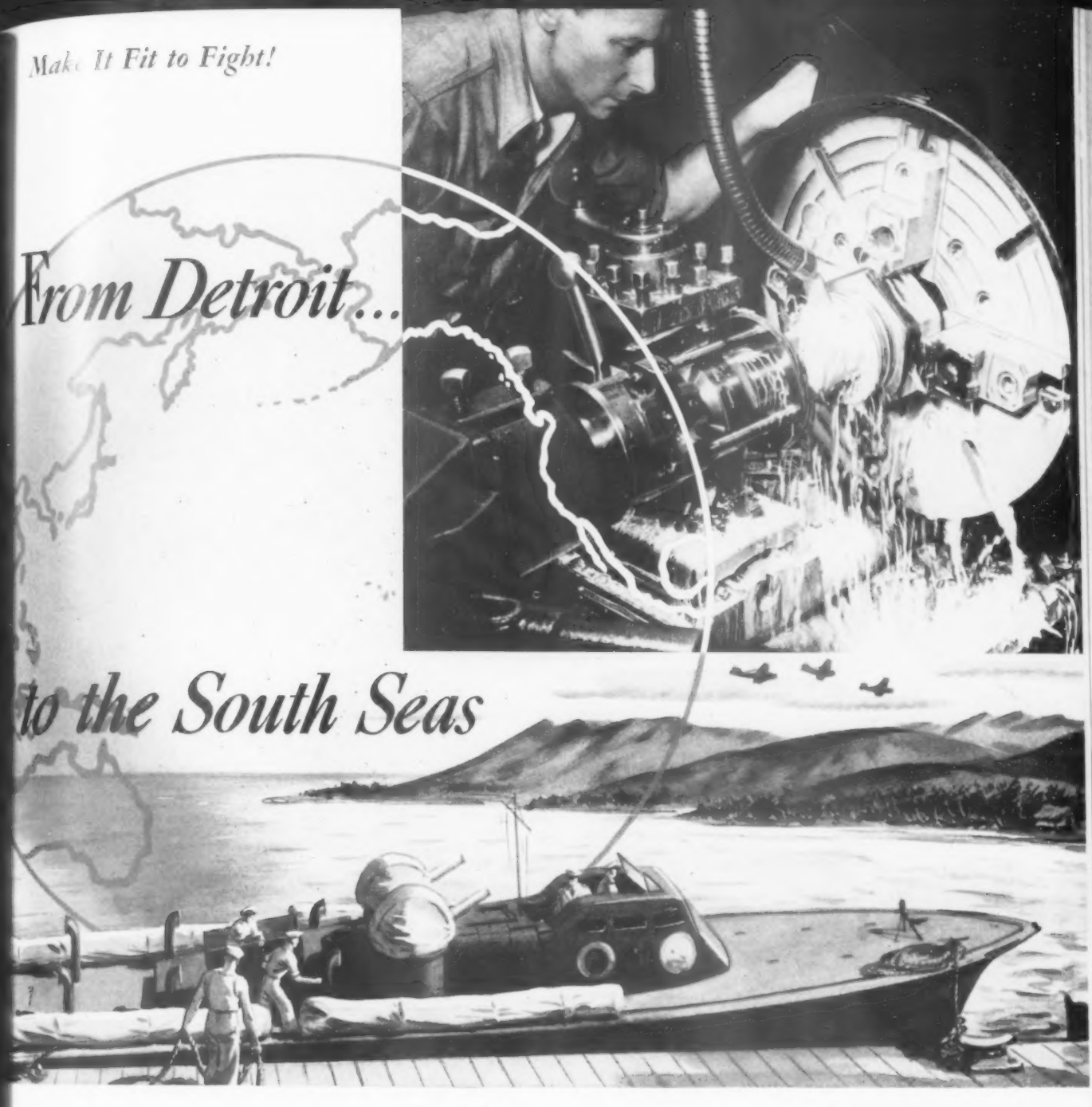
MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

Make It Fit to Fight!



From Detroit...

to the South Seas

to fit within .001"

Extreme accuracy is the secret of interchangeable manufacture. Not only in the more rapid mass production of war's implements, but also in supplying replacement parts—for PT boats in the South Pacific—tanks in North Africa—or fighter planes in England.

To put such accurately machined parts *where* they are needed, *when* they are needed, is a job which calls for Gisholt's rigid construction to maintain precision at high cutting speeds.

GISHOLT MACHINE COMPANY
1229 East Washington Avenue • Madison, Wisconsin

GISHOLT

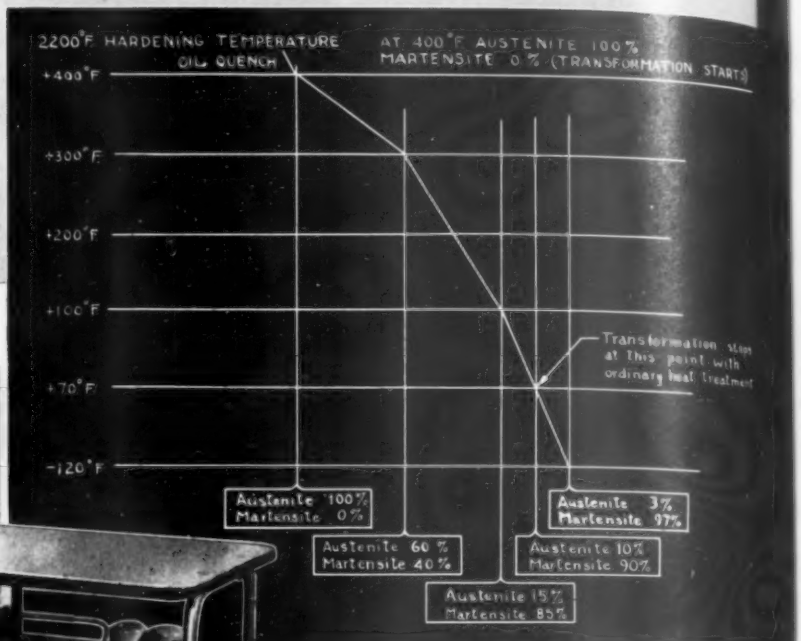
LOOK AHEAD—KEEP AHEAD—WITH GISHOLT IMPROVEMENTS IN METAL TURNING

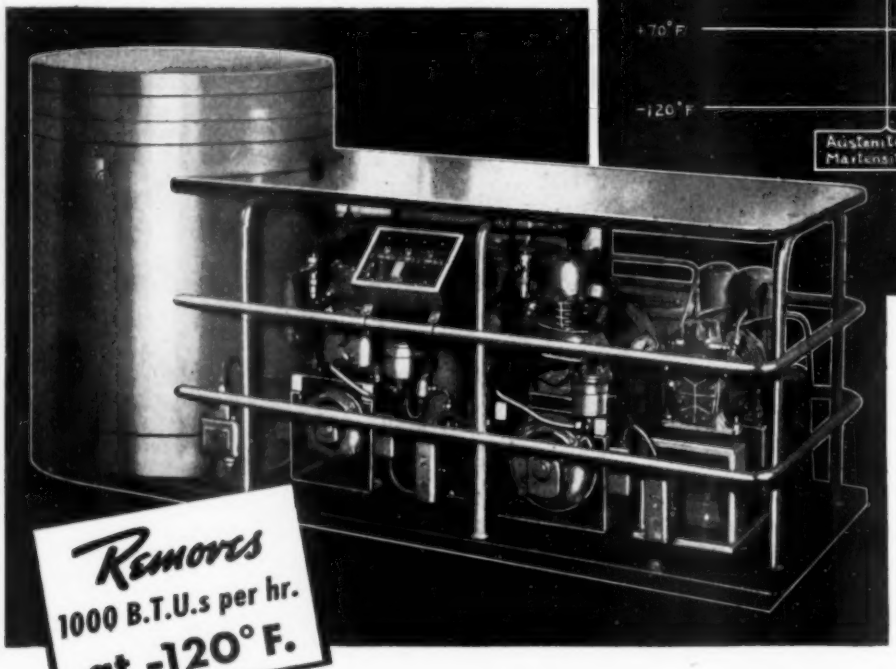
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

At Gisholt, the Army-Navy "E" and the Treasury flag fly side by side.

How Cold Treatment of Steel at -120°F. Results in Transformation of Austenite to Martensite

Provides Extra Hardness and Toughness...Relieves Stresses and Strains...Produces Uniformity of Hardness





Removes 1000 B.T.U.s per hr. at -120° F.

The above chart was developed by a prominent metallurgist showing the curve of transformation of Austenite to Martensite in metal at temperatures varying from 400° F. to −120° F.

● The Deepfreeze Cascade −120° F. Industrial Chilling Machine is finding widespread application in the hardening and stabilization of metals by cold treating at temperatures of −100° F. to −120° F. It has been found that the proper cold treatment will produce a uniformity of hardness that clearly indicates that most stresses and strains have been relieved.

The treatment of metals by the chilling method is as yet too new to understand its full possibilities, but recent tests reveal that chilling of steel at −120° F. in a Deepfreeze immediately after quenching results in a greater transformation of the retained Austenite to Martensite. With ordinary heat treatment the transformation stops when the steel reaches room temperature, leaving approximately 10% Austenite content. However, chilling to −120° F. in a Deepfreeze results in a nearly complete decomposition of the retained Austenite.

Deepfreeze Cascade -120° F. Industrial Chilling Machine for the Shrinking, Testing and Treating of Metals . . .

In addition to the treatment of metals, Deepfreeze Chilling Machines are finding many other money saving applications in a wide variety of industrial fields. The Cascade −120° F. Industrial Chilling Machine shown above has the chilling capacity for high production metal chilling of any part where large quantities of heat must be removed fast. It is adaptable to almost any metal chilling job. Let Deepfreeze engineers assist you in the application of cold treatment to your products.

Example Procedures in the Treatment of Steel by Deepfreeze Chilling Method

REX M.M. HIGH SPEED TOOL STEEL

Heat Treatment (Ordinarily Used)	Heat Treatment (Deepfreeze Method)
Pre-heat.....1550° F.	Pre-heat.....1550° F.
Hi-heat.....2160° F.	Hi-heat.....2160° F.
Quench.....(air)	Quench (air) to +120° F.
Draw.....1025° F. (2 hours)	Deepfreeze to −120° F. (3 hours)
	Warm to atmosphere in air
	Draw.....1025° F. (2 hours)
Cool to room temperature	Cool to.....+120° F.
	Deepfreeze to −120° F. (3 hours)
Draw.....1025° F. (2 hours)	Warm to atmosphere in air
	Draw.....1025° F. (2 hours)
	Cool to.....+120° F.
	Deepfreeze to −120° F. (3 hours)
Rockwell Showed 63-64 C.	*Rockwell Showed 65-67 C.*

NOTE: If the Draw is permitted to go over 1025° F. it will be necessary to repeat the Deepfreeze chilling process.

WATER HARDENED DIE STEEL—The following method is that found best adapted for cold treating water hardened die steel.

1—Heat to 1500° F. (or usual method).
2—Quench at 75° F. (or usual method).
3—Immerse at once into Deepfreeze at −120° F.
4—Draw as usual (if drawing temperature exceeds 875° F. then again immerse in Deepfreeze at −120° F.)

FINISHED PRODUCTS—For the cold treatment of finished products not manufactured by the user, the following procedure is successfully used by many firms with Deepfreeze equipment.

1—Heat to 300° F. in tempering furnace (if furnace is not available use boiling water at 212° F.)
2—Cool to atmosphere.
3—Immerse in Deepfreeze at −120° F.
4—Warm to atmosphere.
5—Repeat cycle 5 to 6 times.

Free Additional Information

For additional information on Deepfreeze equipment send for free copy of bulletin with complete details, specifications, and listing other uses.

Deepfreeze

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

2311 DAVIS STREET
NORTH CHICAGO, ILLINOIS

Division of Motor Products Corporation, Detroit, Michigan

NOT A CLAIM
NOT AN OPINION

But a Fact..

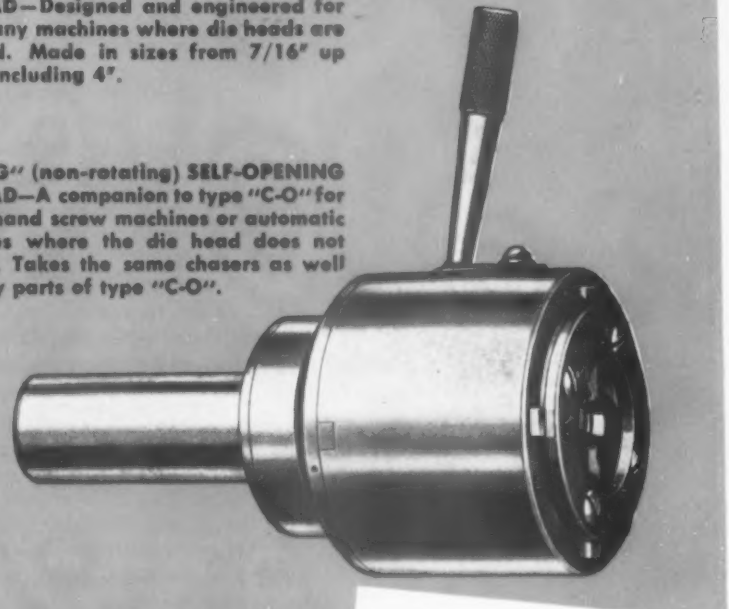
You can get better, faster and more accurate threading and beat your production schedules with

MURCHEY

Threading Tools

4 WEEKS' DELIVERY

TYPE "C-O" (rotating) SELF-OPENING DIE HEAD—Designed and engineered for use on any machines where die heads are revolved. Made in sizes from 7/16" up to and including 4".



TYPE "G" (non-rotating) SELF-OPENING DIE HEAD—A companion to type "C-O" for use on hand screw machines or automatic machines where the die head does not revolve. Takes the same chasers as well as many parts of type "C-O".

Every day, and in the face of exacting government specifications, Murchey self-opening dies and collapsible taps are proving this on threaded parts for tanks, guns, bombs and shells. They are cutting threads to class 3 fits in aircraft parts, tapping the noses of shells and bombs and threading the base end of anti-aircraft shells. The record of these tools is outstanding.

Write for literature on type "C-O", type "G" and on our New Collapsible Machine Tap Type "B-M". Also for folders on Murchey Milling Machines, Shell Tapping Machines and Roller Pipe Cutting-off Machines. You need this literature in your files for ready reference. Address Dept. T.

MURCHEY MACHINE & TOOL CO.
DETROIT 26, MICHIGAN

Always remember—machines must be in perfect alignment to cut perfect threads.

MURCHEY

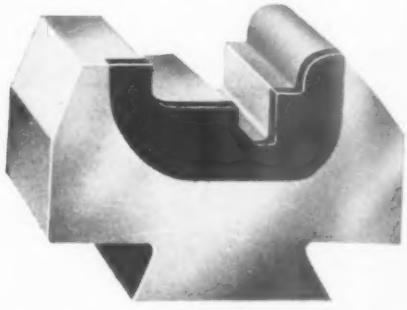
On Many Kinds of Metal Cutting Operations

MIDWEST CEMENTED CARBIDE TIPPED TOOLS

OFFER YOU MORE PRODUCTION ON THE BASIS OF FASTER CUTTING SPEEDS AND SUSTAINED ACCURACY

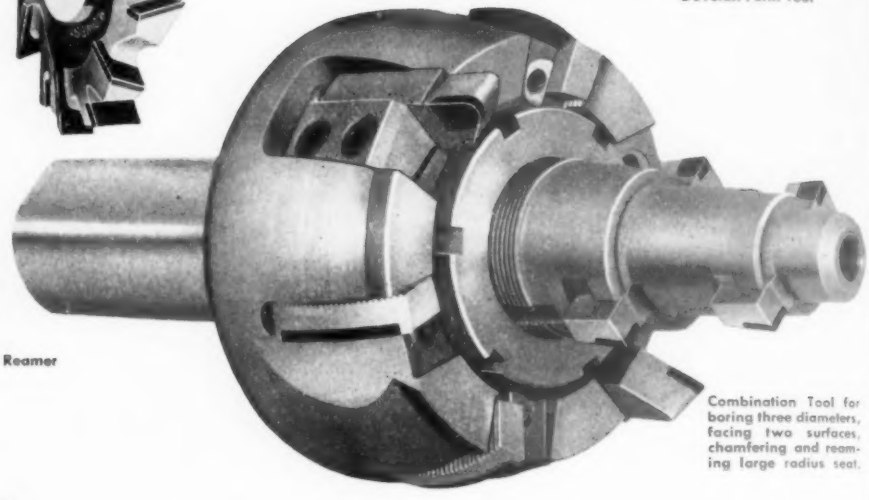
Circular Form Tool

Staggered Tooth Side Mill



Dovetail Form Tool

Shell Reamer



Combination Tool for boring three diameters, facing two surfaces, chamfering and reaming large radius seat.

Shell End Mill

Back Spot Facer

THESE TOOLS provide the possibility of holding your work to closer tolerances for a greater number of pieces, and longer runs between tool sharpening.

Form Tools, Circular and Dove Tail—these tipped tools are designed special from your sketches or part prints. When making inquiry, specify machine on which operation is performed, material to be cut, any other affecting factors.

Arbor and Shank Type Tools—Side Mills, Shell End Mills, Shell Reamers, Spot Facers, Counterbores and various other standard and special types, furnished with cemented carbide tips.

Inserted Blade Cutters—Special types with carbide tipped blades for diversified cutting operations.

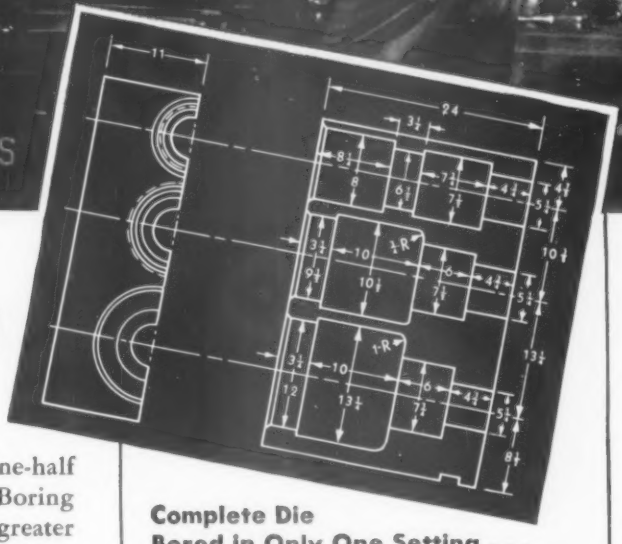
Midwest has been manufacturing carbide tipped tools for about 13 years and is one of the companies engaged longest in the application and use of cemented carbide. Send in a description of your job or problem, Midwest experienced engineers and extensive designing department will assist you on the correct selection, application and use of these and other Precision Metal Cutting Tools designed and manufactured by Midwest over a period of more than 30 years.

MIDWEST TOOL & MFG. CO., 2364 W. Jefferson Ave., Detroit 16, Mich.

MIDWEST

MILLING CUTTERS • SLEEVES • COUNTERBORES • END MILLS • REAMERS • SPECIAL TOOLS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

200 Hours Saved... in Boring Forging Dies



Giddings & Lewis Horizontal with Continuous Feed Facing and Boring Head Cuts 300-Hour Job to 100 Hours . . .

This Forging Die was formerly machined by boring one-half at a time. With the G & L Continuous Feed Facing and Boring Head both parts are machined simultaneously with greater speed, accuracy and economy of cutting tools. Tool settings have been reduced to a minimum. Jump cutting with the old method placed a burden upon the tools. Proper mating diameters and finish are obtained because both parts are machined simultaneously in one setting.

On this and similar dies in this plant the machining time has been cut one-third with the G & L Horizontal equipped with the continuous feed facing and boring head.

Additional flexibility and capacity for handling unusual jobs can be added to your G & L Horizontal through the application of a G & L rotary table together with G & L Continuous Feed Facing and Boring Head. Boring, facing and back-facing can be performed on several surfaces by merely indexing the table and engaging the cross-slide of the head. Investigate the complete features and advantages on this equipment today. Write for the descriptive folder offered at the right.

Complete Die Bored in Only One Setting . . .

Prior to machining on the G & L Horizontal, both parts are opened up straight through on a planer to enable a boring bar to be inserted. The operations on the largest bore are performed as follows. The other two bores are machined in a similar manner.

Operations

1. Bore 5¼" Dia. for a Distance of 4¾" with Conventional Boring Bar.
2. Bore from front 7¾" Dia. Using Conventional Boring Bar.
3. Bore 12" Dia., 13¼" Deep Using Conventional Boring Bar.
4. Recess 13¼" Dia. Using the Continuous Feed Facing Head, Set Off Center.
5. Finish Bore 13¼" Dia. Using the Continuous Feed Facing Head.
6. Form Radius in Corner with Tool Ground to Proper Radius Using Continuous Feed Facing Head.

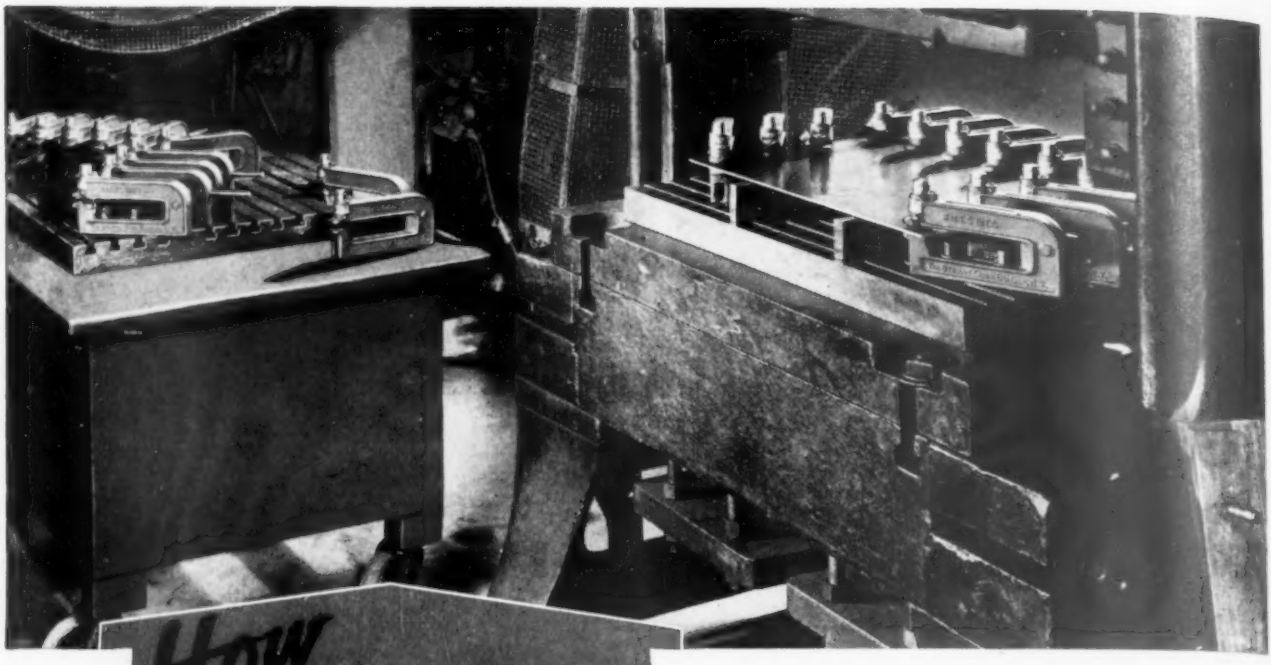
NOTE: Built in scales and verniers easily permit working to .001" on center distances between holes and the location of the bores accurately on the split of the die.

Additional Data

Additional data is contained in this folder. When making inquiry please indicate your business connection and type and size of machine used. Ask for Bulletin No. 95.

GIDDINGS & LEWIS MACHINE TOOL CO.

132 DOTY ST., FOND DU LAC, WISCONSIN



How WALES HOLE PUNCHING UNITS MINIMIZE PRESS "DOWN-TIME" BETWEEN SET-UPS

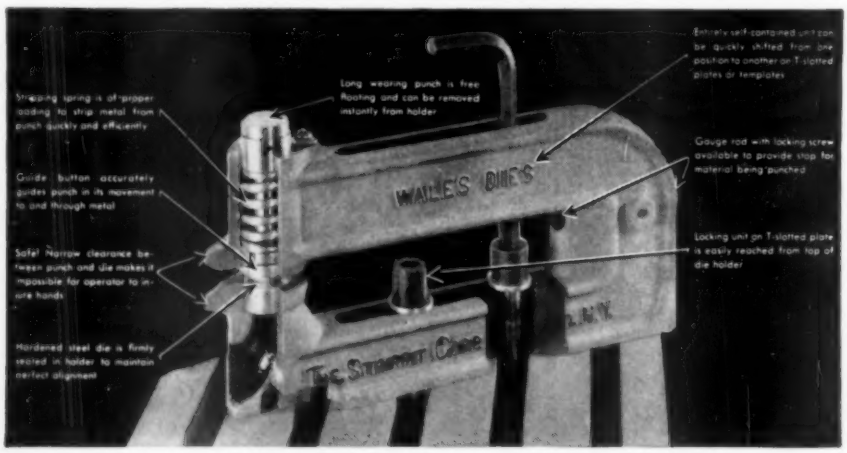
Showing set-up of Wales Units on T-slotted plate ready to operate in stamping press and second set-up of another pattern on table to replace pattern on press bed at end of run. 2 groups of Wales Units and 2 T-slotted plates permit alternating of patterns which practically eliminates press "down time."

Presses can be kept almost in continuous operation by using two Wales T-slotted Plates and two groups of Wales Type "B" Hole Punching Units.

Thus, it is possible to have one pattern of Wales Units operating in press while another pattern is being set up on the second T-slotted plate away from the press. At the completion of the first run, the second set-up is moved onto the press bed ready to start operating. While this second set-up is operating, a third pattern can be set up with the first group of units and T-slotted plate. Transferring patterns in this way minimizes costly and inefficient press "down time."

Such economies are made possible by the following exclusive design features found only in Wales Units:—nothing attached to press ram . . . punch and die are always in perfect alignment which eliminates usual slow, inaccurate punch and die aligning methods requiring hours of die setting time . . . instant removing and resetting of units are possible on T-slotted plates to provide unlimited scattered and straight line patterns . . . self-contained punch and die holder provides independent mounting on T-slotted plates.

"There's Always Something New in the Wales Line."
Keep posted by writing for Bulletin B, TODAY.


Stripping spring is of proper loading to strip metal from punch quickly and efficiently
Guide button accurately guides punch in its movement to and through metal
Safe! Narrow clearance between punch and die makes it impossible for operator to insure hands
Hardened steel die is firmly seated in holder to maintain perfect alignment
Long wearing punch is free floating and can be removed instantly from holder
Entirely self-contained unit can be quickly shifted from one position to another on T-slotted plates or templates
Gauge rod with locking screw available to provide stop for material being punched
Locking unit on T-slotted plate is easily reached from top of die holder
WALES DIES

WALES-STRIPPIT CORPORATION

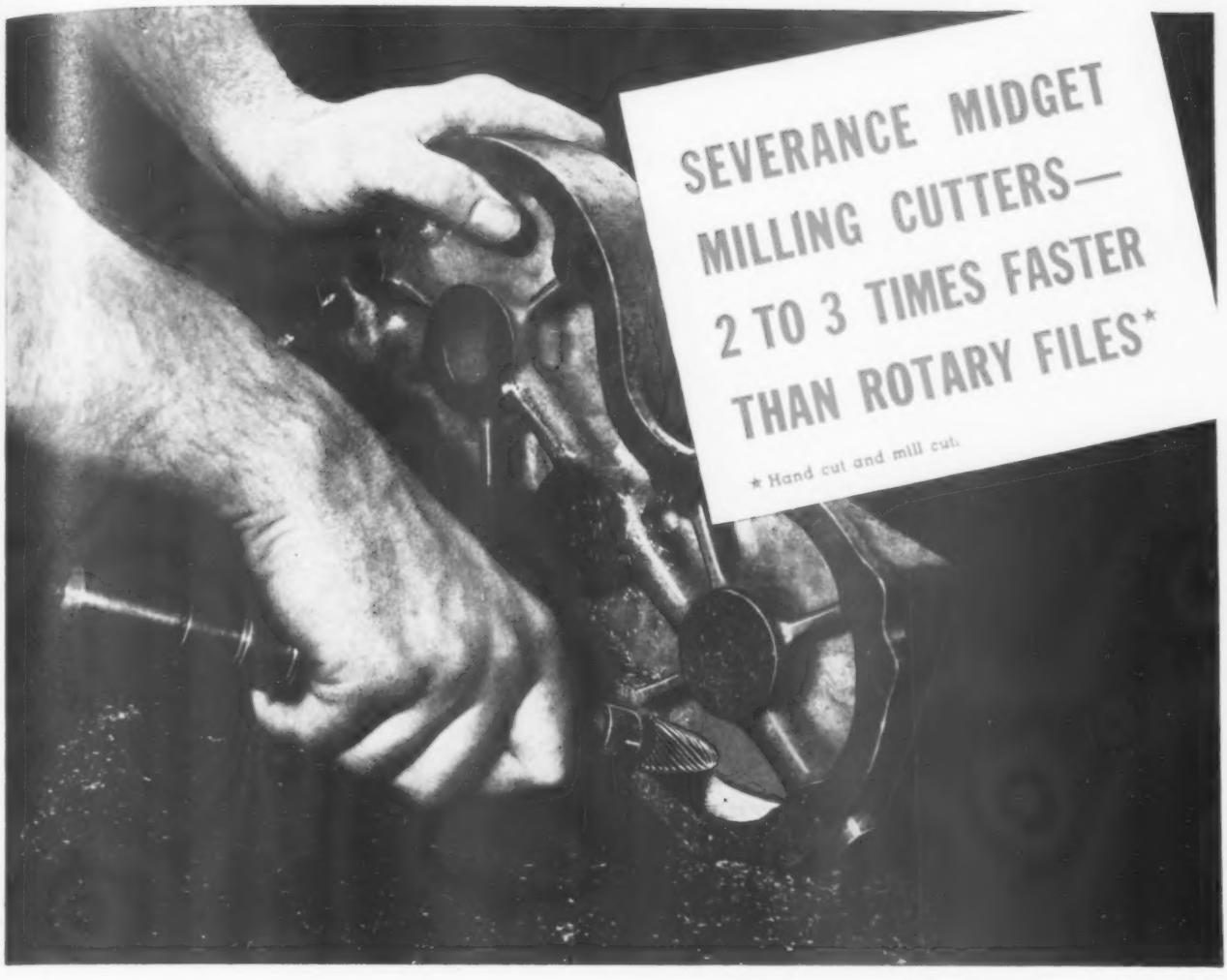
353 Payne Avenue
NORTH TONAWANDA, N. Y.

George F. Wales, President

Specialists in Punching & Notching Equipment

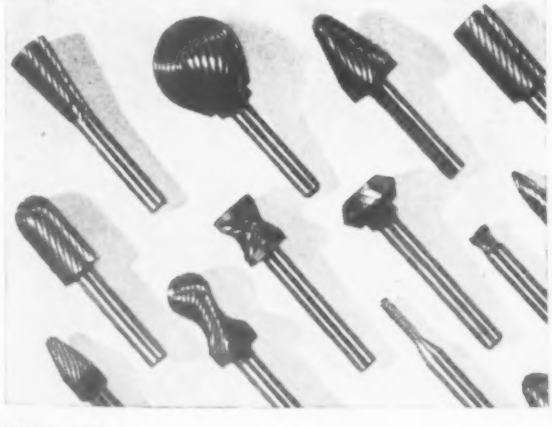
★

***Left:** Cut-away points out the exclusive features of Wales Units.*



FASTER

Because of their hardness, design and keen cutting edges, Severance Midget Milling Cutters speed up finishing time, easily do the job two to three times faster than rotary files. Severance Midget Milling Cutters take deep, sharp bites and throw off real chips rather than merely burnishing.



CHEAPER

A Severance Midget Milling Cutter lasts 3 to 5 times longer than a rotary file and after the teeth are worn, it can be successfully reground as many as 60 times. Thus Severance Midget Milling Cutters not only cost considerably less, but they also save critical high speed tool steel.

BETTER

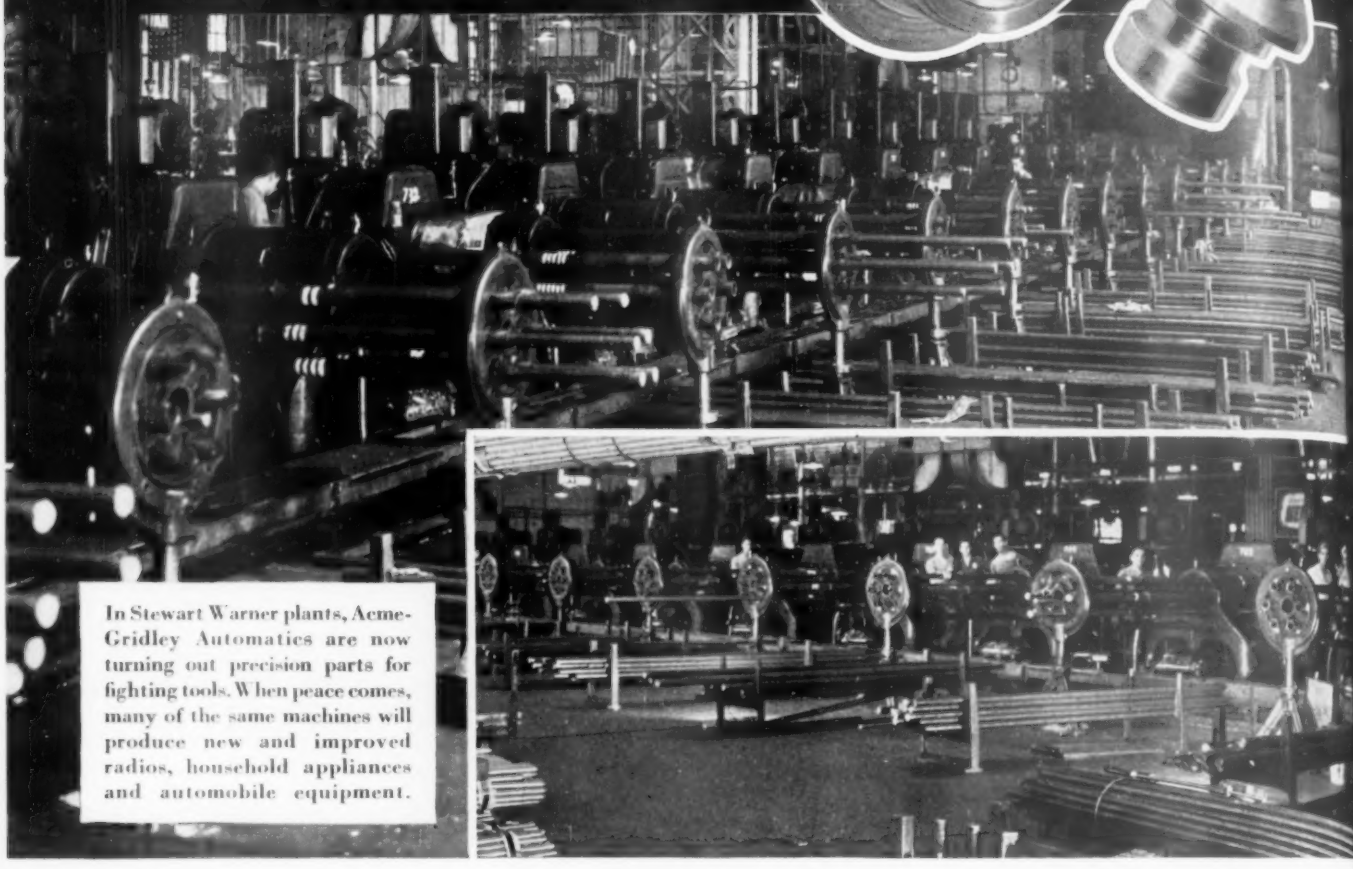
If you are interested in deburring, countersinking or finishing—better, quicker, and at less cost than ever before—it will pay you as it is paying scores of other manufacturers, to use Severance Midget Milling Cutters.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING

SEVERANCE TOOL INDUSTRIES, INC., SAGINAW, MICH. • PLANTS IN LONG ISLAND CITY, N.Y.; DETROIT, MICH.; FORT WAYNE, IND.; CHICAGO; AND LOS ANGELES

IN AMERICA'S GREAT PRODUCTION PLANTS..



In Stewart Warner plants, Acme-Gridley Automatics are now turning out precision parts for fighting tools. When peace comes, many of the same machines will produce new and improved radios, household appliances and automobile equipment.

PRECISION . . . IN "TENTHS" PRODUCTION . . . IN MILLIONS

There is the reason why America's war production is giving our men the best of fighting equipment—and doing it *fast.*

Acme-Gridley automatics are today turning out millions of parts for guns, planes, tanks and ammunition — with dimensions measured in tenths of thousandths — each part accurate and interchangeable.

Production goes on at the highest speeds and fastest feeds modern tools will withstand.

Acme-Gridley automatics will be ready to deliver that same kind of fast, accurate production for peace—at lower costs than we have ever before known.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

STELLITE HIGH-PRODUCTION CUTTING TOOLS
are Available for Prompt Delivery

Stellite "98M2" and "Star-J-Metal" tools are widely used for machining steel, cast iron, and most of the machinable materials. These dependable tools take heavy cuts at high speeds and heavy feeds—with long life between grinds. This means high production at low cost per piece machined.

The types and sizes in which each grade is available, the purposes for which each type is recommended, and the correct grinding wheels to use are shown in the descriptive price lists illustrated below. Copies of any of these price lists will be sent on request.

Stellite "98M2" tools (left) were developed specifically for machining steel, and are also excellent tools for use on brass, bronze, and cast iron. They are hard, tough, and possess good edge strength.

Stellite Star-J-Metal Tools (right) are used on many materials, including steel and cast iron, for a wide variety of operations—including turning, boring, facing, milling, reaming, grooving and forming.

Standard Tools in Stock

SOLID TOOL BITS—Square, flat, or round . . . wide range of sizes . . . finish-ground ready for use in standard tool holders. Easily converted to various profiles.

WELDED TIP TOOLS—A variety of styles and sizes for use where solid bits are impracticable.

MILLING CUTTER BLADES—For many cutter body types, including Ingersoll, Kearney & Trecker, Modern, Production, OK, and Continental.

WEAR STRIPS—Haynes Stellite alloy castings brazed to a mild steel base, for attachment to boring, driving, and pilot bars to assure accuracy and long life.

Special Tools to Users' Specifications

Many types of special Stellite tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, counterbores, spotfacers, and reamers.

STELLITE
Reg U S Pat Off

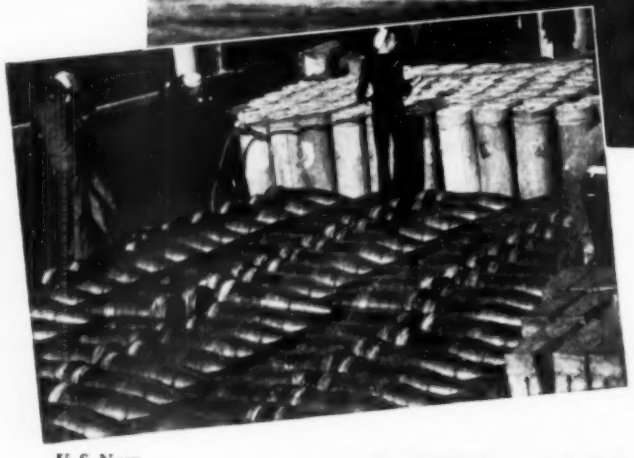
HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

The words "Haynes Stellite," and "Stellite" are registered trade-marks.



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Of Course We Have It!

THAT NEW AMMUNITION PRIMER (U. S. Ordnance Dept. "Spec" AXS-946) for Steel Shells, Bombs and Cartridge Cases

Meets every requirement—yours and Uncle Sam's. Top speed and economy in the finishing department, full surface protection to the ammunition. The chances for corrosion to mar the effectiveness of our calling cards for Hitler and Tojo are greatly reduced when they're finished with EGYPTIAN Primer AXS-946 and top coated with EGYPTIAN enamel,—lacquer or synthetic.

This red EGYPTIAN priming coat developed to meet "Spec" AXS-946 may be applied to the bare metal by spray, brush or dip. When applied by spray it air dries in ten minutes for handling and top coating with enamel. If desired it may be baked for ten minutes at 250°F.

You can depend on EGYPTIAN alertness to meet new and revised Government Specifications, just as you can depend on the quality of every EGYPTIAN FINISH.

Send for Revised "Spec" Book TE

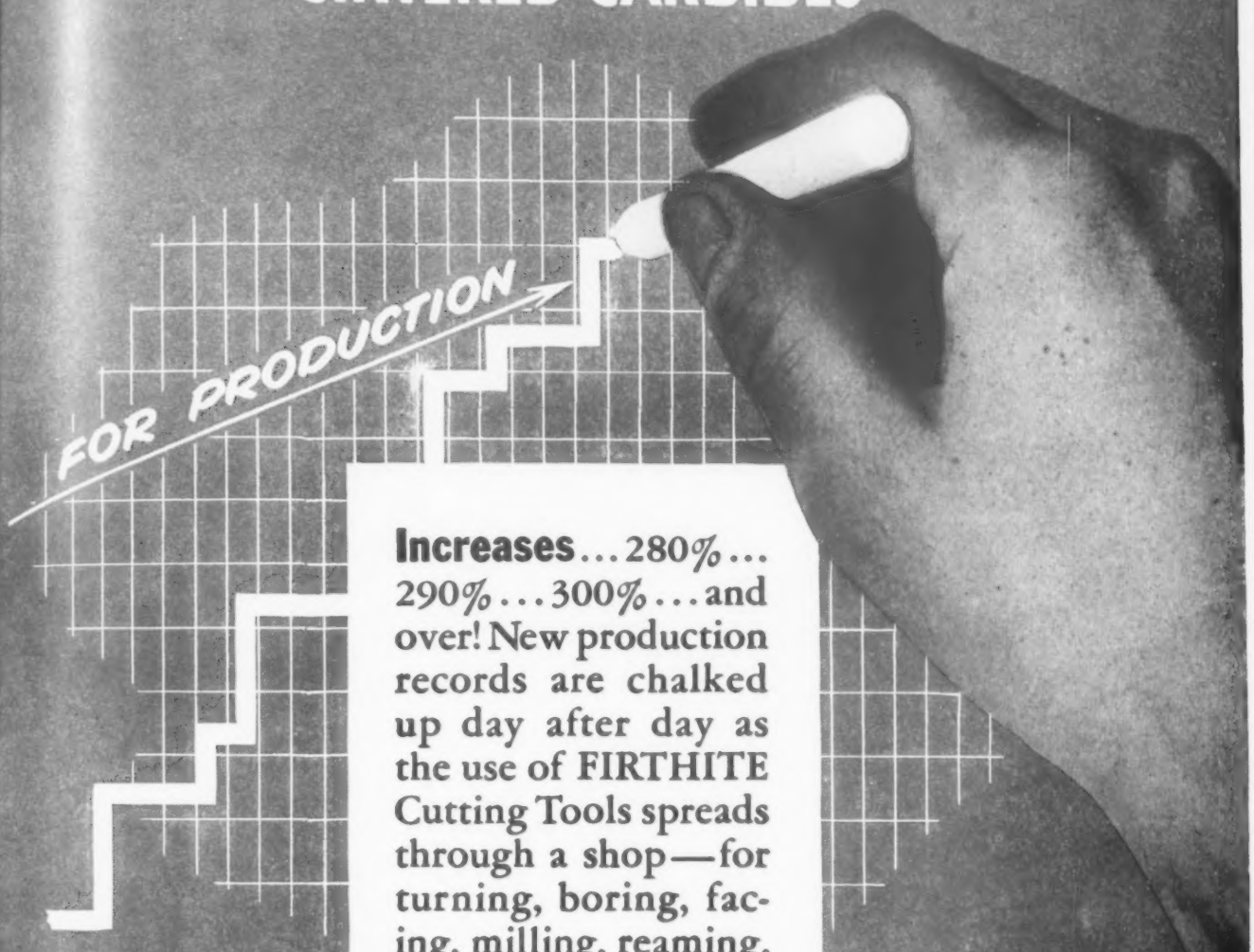
THE EGYPTIAN LACQUER MANUFACTURING CO.
ROCKEFELLER CENTER—NEW YORK 20, N. Y.

EGYPTIAN FINISHES

EGYPTIAN *Superior* FINISHES

FIRTHITE

SINTERED CARBIDES



Increases...280%... 290%...300%...and over! New production records are chalked up day after day as the use of FIRTHITE Cutting Tools spreads through a shop—for turning, boring, facing, milling, reaming.

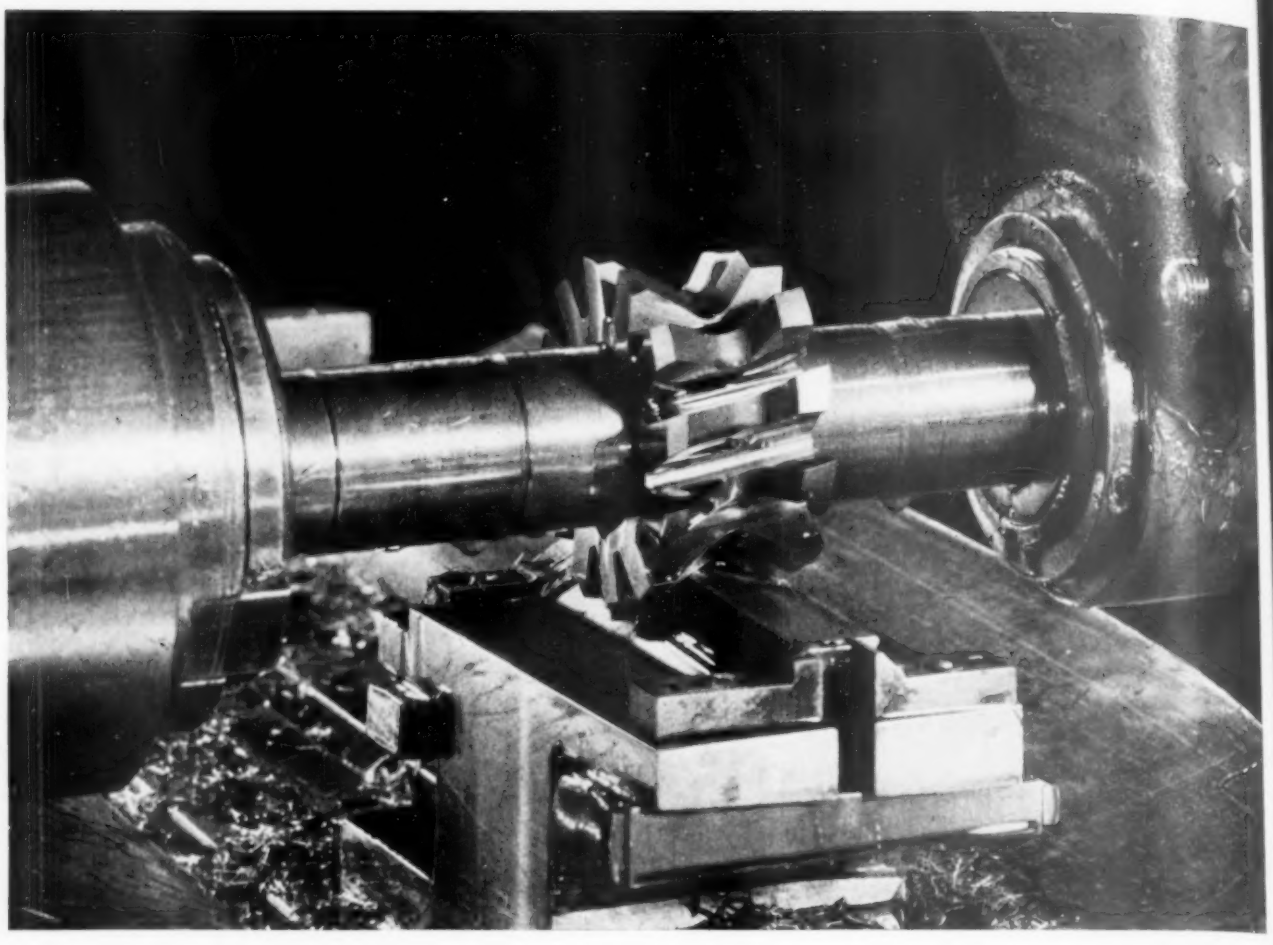
FIRTHITE Sintered Carbides cut metals and non-metallic materials at higher speeds, faster feeds. FIRTHITE Engineers are at your service.

ARMY E NAVY

Firth-Sterling

STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES



A TOUGH JOB . . . WELL DONE . . . WITH A CUTTER DESIGNED FOR PERFORMANCE BY B-C ENGINEERS

TWO cuts, one roughing and one finishing, are completed every 15 minutes on stainless steel turbine blades by this Barber-Colman UNGROUND Formed Milling Cutter, designed specifically for this job. This ability to "design for performance" is an outstanding service rendered by Barber-Colman Company, and has resulted in many production improvements and tooling economies. When you order B-C cutters, be sure to include complete data on the job, and then you may be certain of getting a cutter that will do the job *right.* ● Barber-Colman cutters provide high quality results at low cost for the following reasons: (1) Job specifications are carefully considered, and suitable steel selected. (2) Best available heat treatment is used and each tool carefully checked before shipment. (3) Superior grinding methods insure accurate holes and ground surfaces, to provide true-running cutters. (4) All B-C cutters are sharpened to highly scientific standards, and carefully checked against specifications. ● Facilities are available for early delivery of unground cutters and our engineering department will be glad to make recommendations on your production problems. ● For additional information that will also help you solve many production problems, ask for Bulletin Number F-19 "How To Get The Most Out Of Your Hobs, Cutters, and Reamers."

CUTTING TOOLS ARE SCARCE
MACHINES CAN'T RUN WITHOUT THEM
CONSERVE WHAT YOU HAVE

Two cuts are taken on the turbine blade job shown above, producing a complete operation every 15 minutes. The material is stainless steel, feed is 1.040" per minute, and cutter speed 35 r. p. m. A Barber-Colman *Unground* Special Formed Milling Cutter is used.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 213 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

STEP TURNING...

3 times as fast!

MONARCH PERFORMANCE REPORT

Lathe Size 16 x 48 BB- Automatic Sizing
Customer Reliance Elect. & Eng. Co.
Part Name Shaft
Material S.A.E. 1045
Heat Treat None
Operation Turn for grinding- Leave .020 Grind Stock
R. P. M. 420
Surf. Speed 275
Feed .015
Max. Depth of Cut 1/4"
Type Cutting Tool Carbide tipped

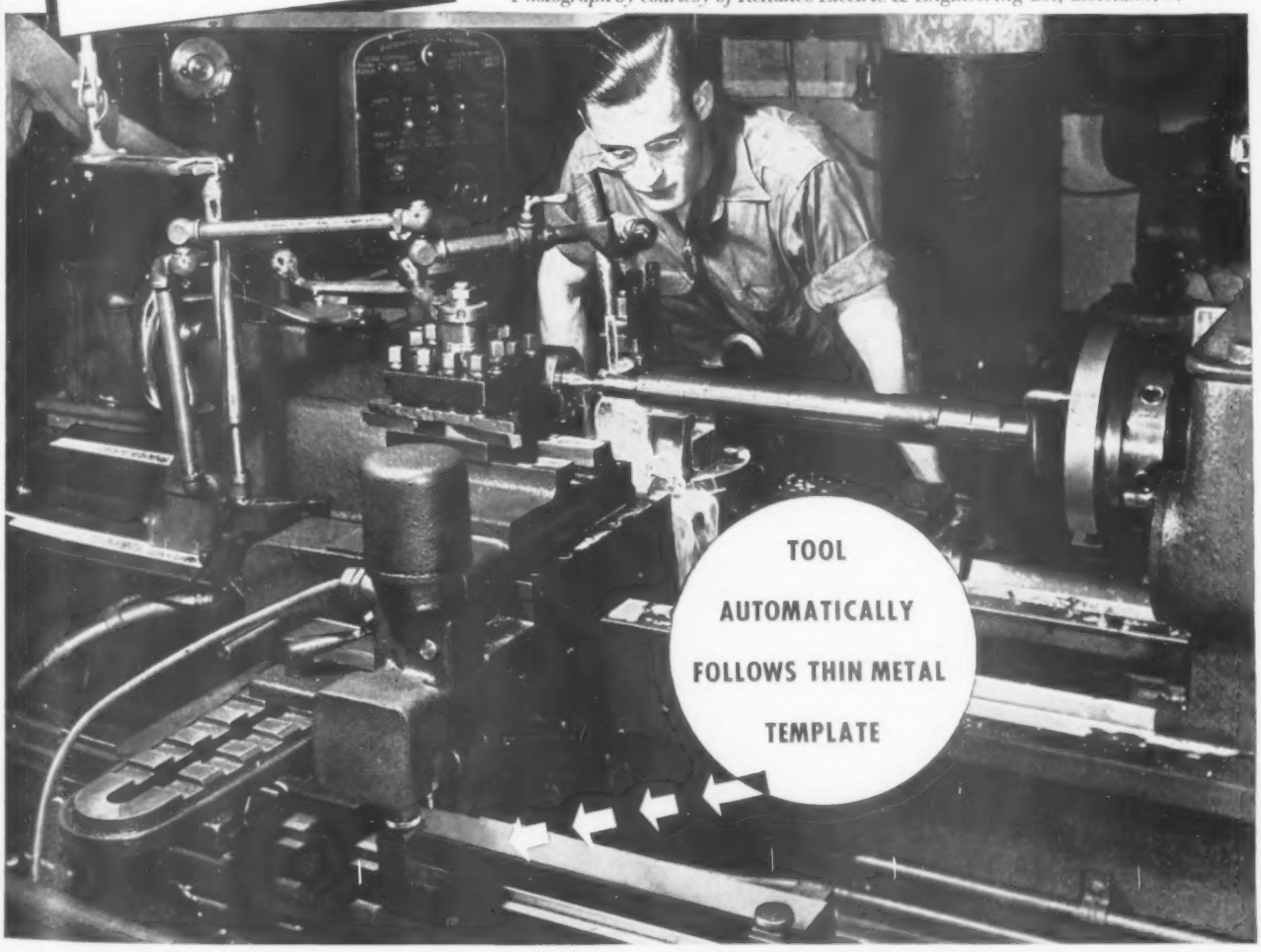
Actual Cutting Time 3.21 Min.
Load Time 4.46 Min.
Approx. Tool Life 55 Min.
Memorandum Foreman reports production 3 times as fast as on manually controlled lathes.

Turning the job illustrated is accomplished three times as fast on Monarch lathes equipped with automatic sizing, as was formerly done on standard lathes with manual control. It is typical of what can be accomplished on such work as turning, boring or facing or combinations of these operations. If you are interested in the application of Monarch's automatic sizing, to work in your plant, our engineers will gladly work with you.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY · OHIO

MONARCH LATHES Save Time

Photograph by courtesy of Reliance Electric & Engineering Co., Cleveland, O.



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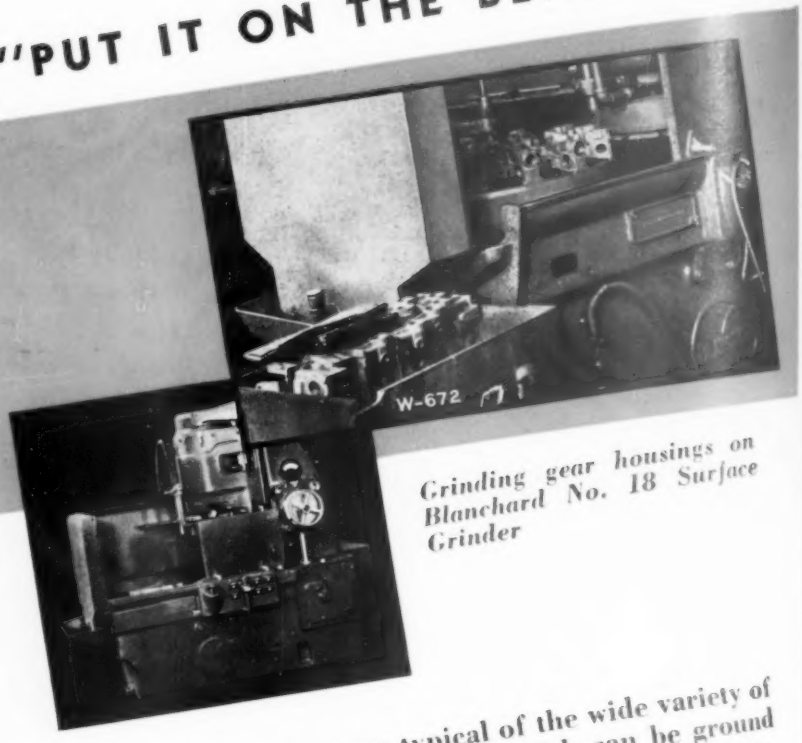
"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- **Adaptability**
- **Fixture Saving**
- ★ **Operation Saving**
- **Material Saving**
- **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*



Grinding gear housings on Blanchard No. 18 Surface Grinder

THESE gear housings are typical of the wide variety of small cast iron and steel parts which can be ground better on a Blanchard No. 18 Surface Grinder. The parts require a smooth surface for an oil-tight joint.

1/16″ of stock is removed from one side of these cast iron housings to limits of ±.0002″. 50 pieces are produced per hour.

By Blanchard Grinding, assembly costs can be reduced, hand fitting and scraping eliminated. Other advantages on such pieces are—saving fixture expense, no chipping of corners; chilled or sandy castings cause no difficulty. High production with accuracy is easy the Blanchard way.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

Boost War Production

with your present labor force . . . by using DELTA POWER-FEED DRILL PRESSES

Delta Features

1. Worm-driven power feed operates directly off motor — giving 8 *rates of feed for each spindle speed.*
2. One swift hand motion brings drill down to work — flip of power lever starts power feed.
3. Automatic stop holds depth of holes to close tolerances; spindle returns automatically.
4. *Instant* switching from heavy power-feed operations to sensitive hand drilling.

It doesn't cost a fortune or entail a long delay for retooling, to install Delta Power-Feed Drill Presses. Standard low-cost Deltas, used in hundreds of war plants, give quick relief from production "jams." Speedy operation saves time, power feed works automatically while operator loads another jig or works on another spindle — adding to output, cutting costs.

These are thoroughly engineered, substantially built, good-looking machines, made in a modern machine-tool plant devoted entirely to tooling war industries. Advanced design combines best features of machines of this type. Safe, dependable, performance under the punishment of war production, quickly pays for the machines and confirms your good judgment in installing them.

Your Delta distributor can show you ample evidence in your vicinity. Consult him — ask about priorities and deliveries. Mail the coupon for new Delta catalog.

M-3

Floor type 4-spindle model at left. Other models with one-piece tables: Floor and bench types, single spindle; floor type, 2-spindle. Floor types with sectional tables: 3-, 4-, 5-, 6-, and 8-spindle. All models available with Slo-Speed or High-Speed No. 2 Morse Taper or ½" Jacobs Chuck spindle.

DELTA MILWAUKEE Machine Tools

Tear out this coupon, mail today

THE ARMY-NAVY "E" — *awarded for excellence in the production of machine tools vitally needed in the war effort.*

THE DELTA MANUFACTURING COMPANY
610K E. Vienna Ave., Milwaukee 1, Wis.

Please send me your new catalog giving full details on the Delta Power-Feed Drill Presses and your full line of low-cost machine tools.

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Company.....

Address.....

City..... (.....) State.....

SURFACE AND LAPPING PLATES GROUND ON MATTISON SURFACE GRINDER

OVERALL FLATNESS HELD TO LIMITS OF A FEW TENTHS

Mattison Precision Surface Grinder used by Challenge Machinery Co. to finish surface and lapping plates — exacting manufacturing specifications demand excellent finishes, with flatness held overall to limits of a few tenths.

Surface and lapping plates are precision ground on the Mattison High-Powered Precision Surface Grinder at the Challenge Machinery Company. Exacting manufacturing specifications demand excellent finishes, with flatness held overall to limits of a few tenths. Important savings have been effected through the substitution of grinding for previous method, as well as a substantial increase in production.

Rugged, high-powered and versatile Mattison Grinders are built to handle your grinding jobs on a real production basis, providing very close accuracy and a fine finish. They are offered in a wide range of sizes to meet every requirement from 12″ to 36″ wide by 36″ to 192″ long.

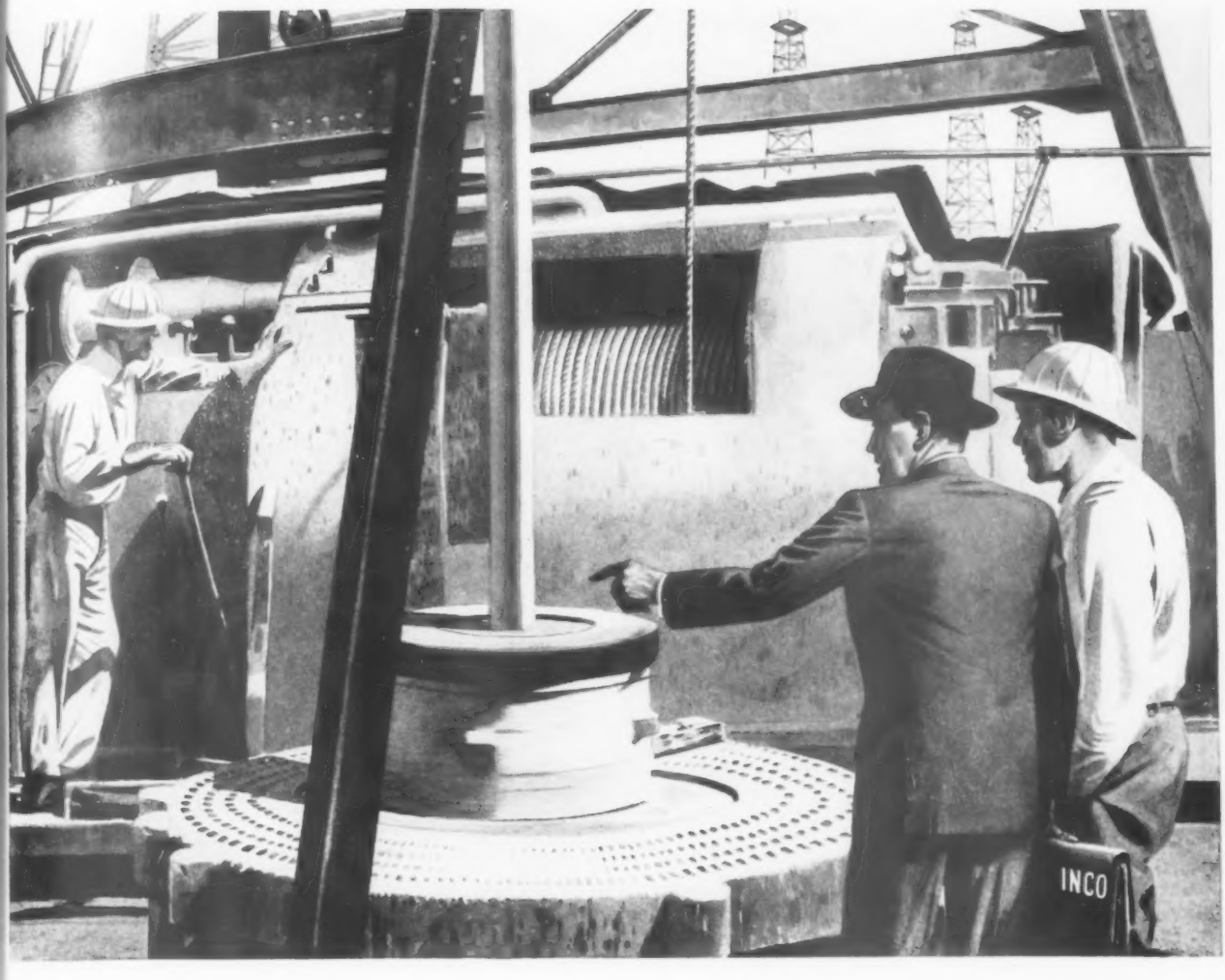
SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

A free booklet will be sent upon request, showing how others have reduced time and increased production with the Mattison Grinder.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS



NICKEL AIDS THE PETROLEUM INDUSTRY

to KEEP 'EM PRODUCING!

Oil is ammunition. On every battle front, oil is war material number one.

Besides power for ships and subs, planes and tanks, trucks and jeeps, it also provides the basic ingredients for synthetic rubber, toluene for TNT, chemicals, and many other essential war materials.

To meet increased wartime demands for oil, field and pipeline equipment carries heavier loads. Refineries make longer runs at high heats and pressures. Engineers add sub-zero cycles and new catalysts. Equipment is taxed up to and sometimes beyond rated capacity . . . precision equipment that cannot be readily replaced.

Despite emergency schedules, however, that equipment rarely fails. For, since the days when shallow wells were drilled with wooden rigs and kerosene was shipped in oak barrels, oil men have relied largely on stressed parts strengthened and toughened by additions of Nickel.

The oil industry knows many uses for Nickel alloyed materials, from crown blocks to drill bits, from sucker rods to pressure stills. Alone, or in combination with other alloying elements, Nickel helps metals resist corrosion, retard wear and absorb shock overloads. Properly used, a little Nickel goes a long way to insure dependable, uninterrupted operation of production and refining units.

For years the technical staff of International Nickel has been privileged to cooperate with petroleum engineers whose pooled information and "know-how" are now so vital to Victory. To men in all industries who desire assistance in the selection, fabrication and heat treatment of ferrous and non-ferrous metals, INCO engineers and metallurgists offer counsel and data.

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New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects — from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

★ *Nickel* ★

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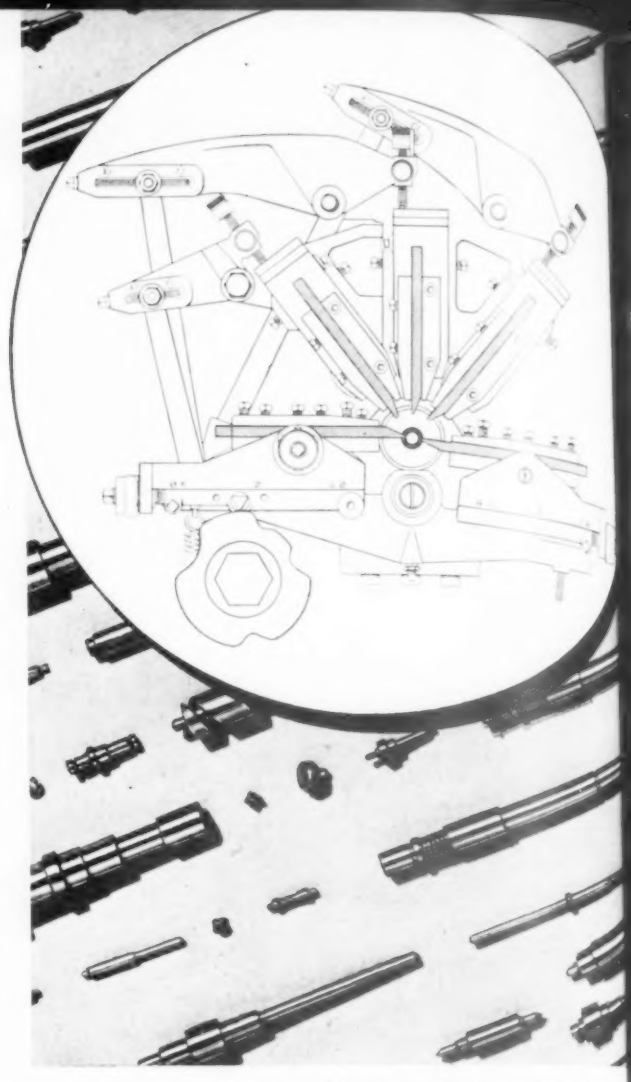
OF SET-UPS
OF ADJUSTMENTS
OF OPERATION

ALL VITAL PARTS AND CONTROLS INSTANTLY ACCESSIBLE ON

GORTON 16-A
PRECISION AUTOMATIC

The Gorton 16-A requires only the simplest single-point tool bits for the production of the most complex precision parts. Unique Gorton operating method insures extreme accuracy with exceptionally high finish; subsequent finishing operations are usually unnecessary.

Maximum accessibility of all five tool slides, tools, micrometer adjustments and all cams insures simple, quick, low-cost set-ups. Centralized fingertip controls provide infinitely variable spindle speeds (1100 to 10,000 r.p.m.) and infinitely variable cam feeds (20 to 720 pieces per hour; 20 to 1440 optional). *No speed or feed gears to change.*



WIDE RANGE OF WORK
TURNS ANY DIAMETER from .005" to 7/16" Bar Capacity of Ma

PRECISION PARTS
COMPLETE IN *1* OPERATION

The Gorton 16-A produces an almost endless variety of short or long slender parts—complete in *one* operation. It does step and contour turning and chamfering in multiple diameters...it centers, drills, threads, slots...it tapers, knurls, back recesses, pivot points, etc.

In achieving new advances in accurate, high speed, automatic screw machine production, the Gorton 16-A assures you of maximum efficiency in meeting the vital needs of today and those of the postwar period.

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1893-1943

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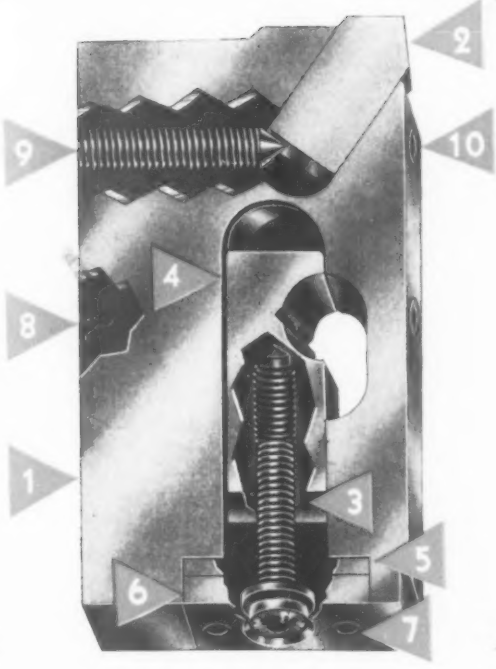
SPECIALISTS FOR 50 YEARS IN REPRODUCING FROM MASTERS—ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES

A Complete Innovation in Boring-



THE DAVIS SINGLE CUTTER MICROMETER ADJUSTABLE BLOCK — for Horizontal Boring Machines!

NOTE THESE *10 Exclusive Features!*

1 **BLOCK BODY, made of hardened tool steel. Made up to the largest practical dimensions, considering the bar diameters and bores for which it is recommended.**

2 **CUTTING BLADE, manufactured with greatest precision possible, is interchangeable within type and size limitations. Blade is the largest practical size considering block dimensions, insuring proper heat radiation and maximum cutting life.**

3 **MICROMETER ADJUSTING SCREW, graduated to read in thousandths, controls the position of the gib and indicates directly the movement of the block body and cutter.**

4 **GIB, hardened and precision ground to fit dovetailed slot in block, allows for seating and accurately clamping of block with taper lock screw. The taper lock screw clamps the block firm against the rear of the slot.**

5 **KEEPER PLATE, regulates the position of the micrometer adjusting screw.**

6 **KEEPER BLOCK, holds micrometer adjusting screw and keeper plate in assembly.**

7 **KEEPER BLOCK SCREWS, hold the assembly in position in the block.**

8 **CENTERS, accurately located with relation to the minimum setting of cutter, thus permitting circle grinding of the cutter on diameter.**

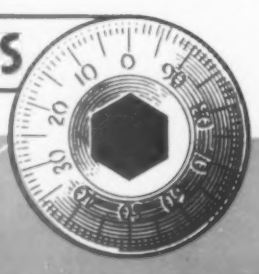
9 **CUTTER SUPPORT SCREW expands and supports blade. Cutting thrust pressure is taken by this sturdy screw, which comes in contact with blade at an angle, preventing screw from vibrating loose under severe conditions.**

10 **CUTTER LOCK SCREW clamps the blade firmly and rigidly in position, forcing blade back against the support screw and firmly up against the top of blade slot, forming an extremely rigid and substantial tool.**

This newly designed block provides an efficient and economical setup for rough, semi-finish and finish boring operations. It is also suitable for use in Davis bars with standard-sized block slots.

DAVIS BORING TOOLS

Write for Descriptive Bulletin No. 600



DAVIS BORING TOOL DIVISION
LARKIN PACKER COMPANY INC., ST. LOUIS, MO.

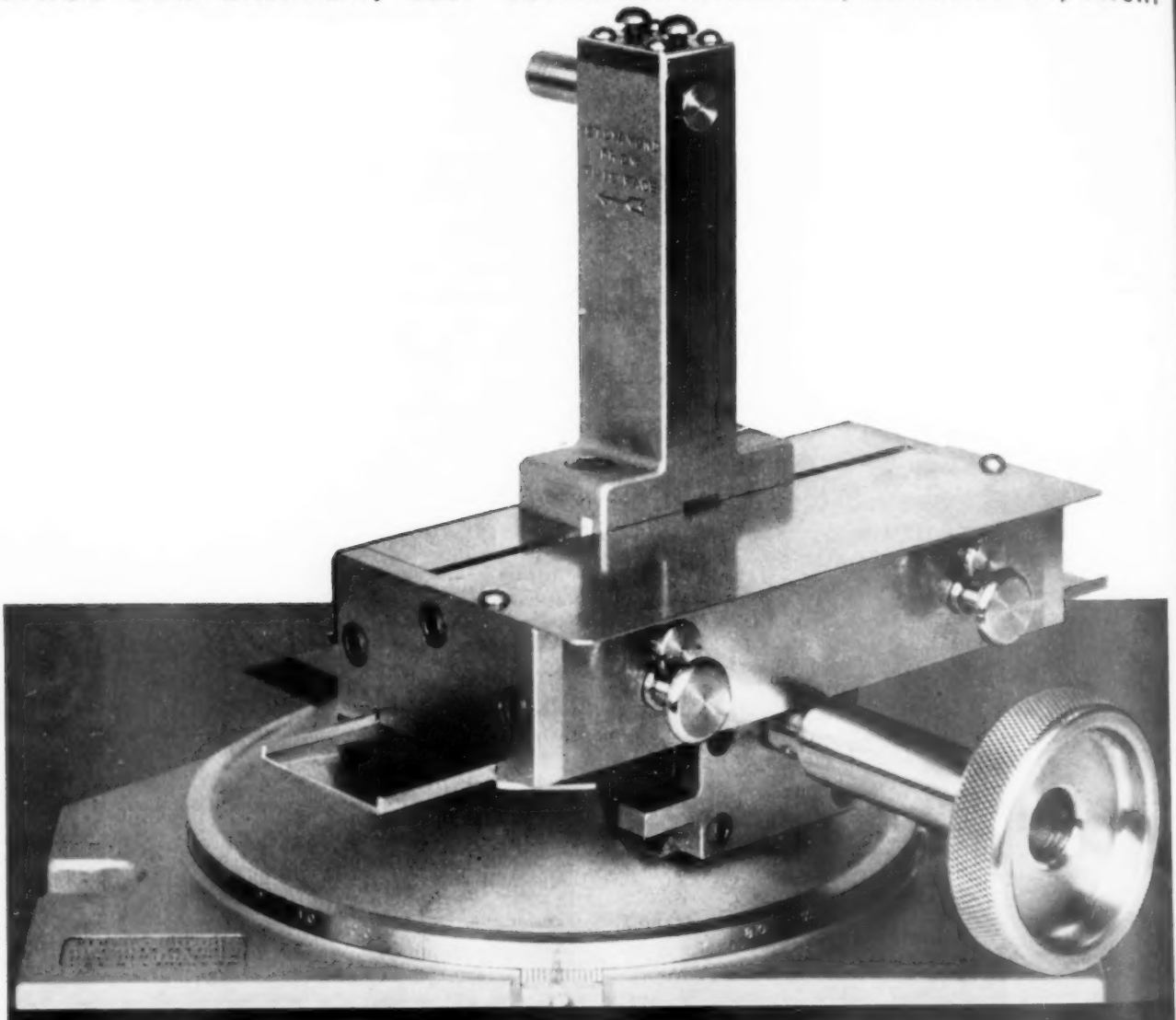
Practical, Sturdy, Accurate

The fact that every part used in its manufacture is carefully machined to a high grade of precision and assembled with care and accuracy, makes the VINCO (B-1) Angle Tangent to Radius Dresser one of the really sturdy dressers in use today.

Rotating on specially designed precision bearings, the action is fast as well as easy and smooth. It can swing an accurate radius and true tangents to that radius without changing the position of the diamond, and it dresses to within .0001″ accuracy. This Dresser will give economical and trouble-free service for a lifetime under ordinary operating conditions.

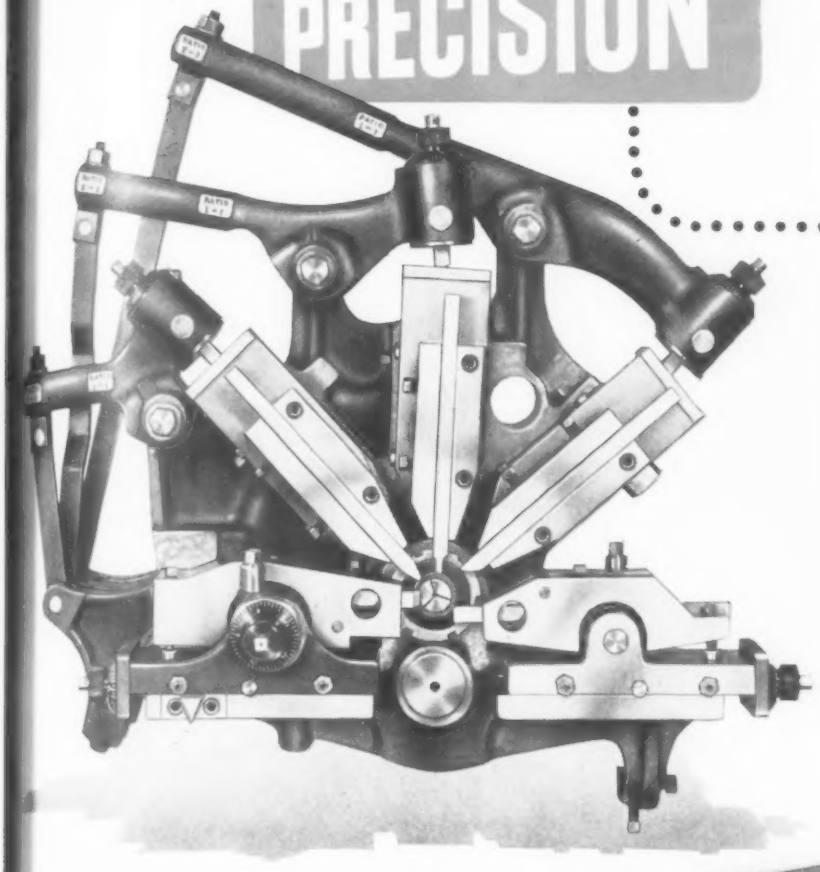
Backed by VINCO's long experience in the manufacture of high precision gages and inspection instruments, the B-1 Dresser is made with the care usually given to the finest and most accurate gages, and therefore is one of the most practical, sturdy and accurate dressers made.

VINCO CORPORATION, 8857 SCHAEFER HIGHWAY, DETROIT 27, MICH.



MILLIONTHS OF AN INCH FOR SALE BY VINCO

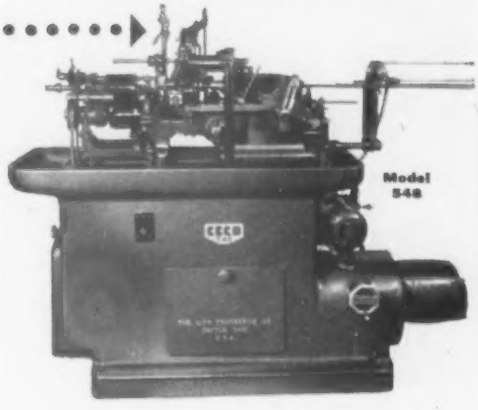
One-Operation PRECISION



CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES



Highlight Features!

BAR CAPACITY: 3/8" and 1/2"

4 or 5 RADIAL TOOL SLIDES.

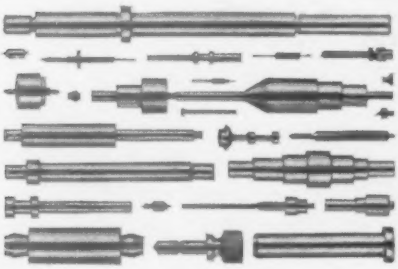
MAXIMUM TURNING LENGTH: 4" with flat cam.

MASTER SPEED RANGER: Varies Spindle speed from 675 to 7500 R.P.M. at the turn of a handwheel.

PRECISION ROLLER BEARING SPINDLE: Always in adjustment.

CONSTANT RISE FEEDING MECHANISM gives extreme feeding accuracy.

Serving some of America's greatest precision-makers, including Norden, Kollsman, Sperry, Bendix and many others, the Ceco Automatic is revolutionizing the mass production of small intricate parts—cutting tool costs, speeding the set-up and producing *one-operation precision work* with amazing economy and efficiency.



THIS BOMBSIGHT PINION SHAFT IS AN EXAMPLE OF CECO'S ONE-OPERATION, HIGH-SPEED PRECISION PRODUCTION

Produced by Ceco *in one operation* instead of three formerly required, and with single tip tooling, thereby eliminating form tools commonly used, is the Bombsight part reproduced above.

Shown on this page are a few of the hundreds of parts Ceco produced in *one operation* with extreme accuracy and high finish. Odd shapes and multiple diameters, also complicated forms, including tapers, bevels, radii, etc., are Ceco-produced with single tip tools. Result—quick set-up, low cost, and faster high precision production of intricate parts. For information and literature write:

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DAYTON, OHIO

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1 RUGGED PLASTIC BODY AND HANDLE

2 MOTOR OF FINEST ALLOY STEELS

3 FULL BALL BEARING CONSTRUCTION

4 1 LB. 12 OZ. WEIGHT

5 6¼" OVERALL LENGTH

6 2500 RPM

7 ⅛", 3/16", ¼" OR 5/16" JACOBS CHUCK

THE NEW ARO PNEUMATIC DRILL WITH *Plastic* CASE

Again ARO Engineering Leadership scores an important "first"—bringing you this new Model 101 ARO Pneumatic Drill with *all-plastic housing and handle!* It's today's lightest-weight portable pneumatic drill—yet it packs power-to-spare and durability for toughest small tool production jobs. Its lightness makes it ideal for women workers. Trigger touch controls speed.

Proved in exhaustive tests in our laboratories and in numerous production lines... this new ARO Pneumatic Drill meets industry's need for *greater speed* and *less fatigue* in round-the-clock production. Investigate ARO!

THE ARO EQUIPMENT CORPORATION
BRYAN, OHIO

ARMY E NAVY

THE ARO EQUIP. CORP. PNEUMATIC ARO TOOLS BRYAN, OHIO

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ght now your production st reach new peaks. Victory ends on it! . . . In the peace follow, *competition* will demand in your shop a continuation of this same efficient production.

Simplex Machine Tools re Precision Built for Precision Production

fit with Simplex's high production, low cost, *accurate* ing and milling. Simplex ring Machines are available 25 types and sizes, in both echanical and hydraulic eds. Simplex Unit-Type Boring Machines may be had in ngle and double end, three four way; also in knee and gular types. In addition, a de range of models is offered Simplex Planer-Type Production Milling Machines. ecial production machine ols built to meet your individual requirements.

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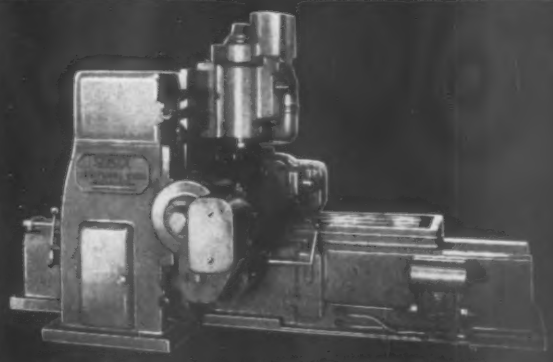
nd coupon now for FREE talogs describing the many vantages of Simplex Boring nd Milling Machines. Include lueprints of parts for FREE timates and specific machine commendations. There is no ligation.

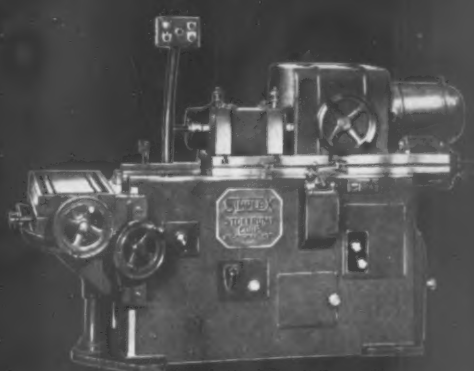


SIMPLEX PLANER-TYPE PRECISION MILLING MACHINES. For high production milling of duplicate parts, or for general-purpose face milling of similar parts. Available with 1, 2, 3 or 4 heads for simultaneous milling of several surfaces. (3-head machine shown.)

SIMPLEX PRECISION BORING MACHINE No. 1. Provides maximum economy and accuracy in boring small parts such as precision bearings, actuating cylinders, etc. With 1 or 2 spindles. (2-spindle machine shown.)

SIMPLEX UNIT-TYPE PRECISION BORING MACHINES. New flexibility provides wider application than conventional machines. Shown is No. 2U 3-Way Machine with 3 No. 3 spindles, arranged for boring differential housings, air and electric tool parts, governor housings, etc.

SIMPLEX PRECISION BORING MACHINE, SERIES 200, 4 spindles. Especially designed for shops where a large number of production jobs of varying types must be handled by one machine.



SIMPLEX KNEE-TYPE PRECISION BORING MACHINES. Model No. 3U, illustrated above, is equipped with No. 3 spindle, variable speed spindle drive, turret stop for table. Designed for accurate, precision boring, particularly where one machine must be used for a variety of jobs.

SIMPLEX DOUBLE-END PRECISION BORING MACHINE No. 1. Arranged for double-end operation in boring automobile steering spindles, etc. Work fixtures are mounted in the middle.

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COMPANY

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CITY

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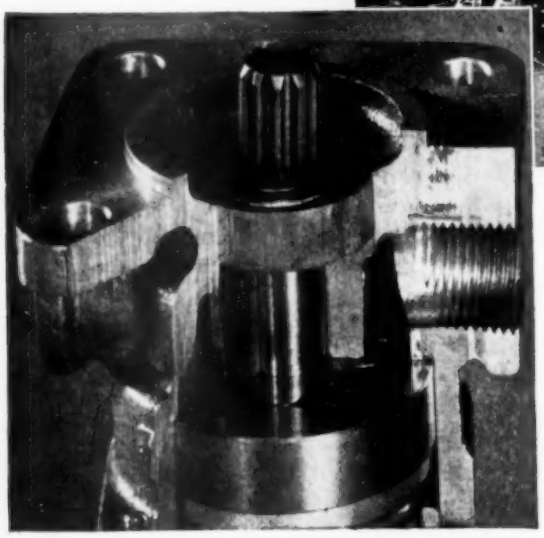
STOKERUNIT CORPORATION

MILWAUKEE, WISCONSIN

LINES BEHIND THE LINES

"PLENTY! RIGHT NOW!" IS THE AIRCRAFT INDUSTRY'S SLOGAN —FROM PRODUCTION LINES TO FIRING LINES WITH SPEED!

Confronted with the necessity of mass production, the aircraft industry quickly sought and quickly found new methods to machine precision parts at a production rate. Broaching is becoming more and more aviation's way of meeting split second schedules. Broaching — a better way to do many metal working jobs — is the only *right* way to do some!



Cutaway view of Eaton aircraft fuel pump shows distinctive rotor principle, depending for efficiency on accurate fitting.

Teeth in outer rotor are broached on a standard American hydraulic broaching machine. American broaching tools, designed specifically for the task, provide high output at economical cost. American's *complete* broaching service—machines, tools, and engineering — makes war production more efficient, post-war production more profitable.

BROACHING IS BETTER
THE *American* WAY

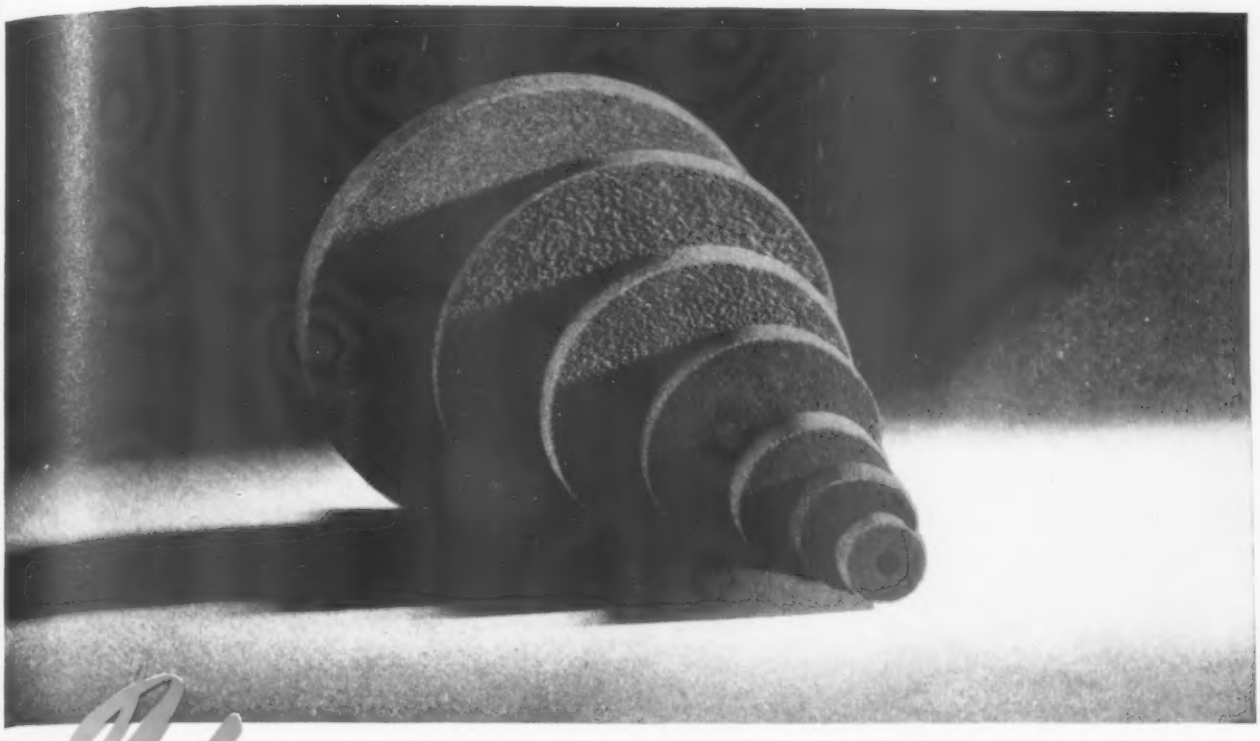
American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.



Yes WE DELIVER ON TIME

No holding up vital jobs while you wait for your grinding wheels or mounted wheels*.

Timing and scheduling are everything now. That's why our streamlined QUICK SERVICE is such an important asset.

Fully approved and endorsed by W P B, here's our war-time speed setup:

- Manufacture only wheels 3" in diameter and under. To speed production, larger sizes are eliminated for the duration.
- No quitting whistle. We are on the job making wheels 24 hours a day, every day.
- Our central location brings us closer to many plants. No time lost in transfer connections or long distance shipping.

CHICAGO GRINDING WHEELS

The wheels of proved quality—known for performance, cutting and long life.

Any shape, grain and grade, any size up to 3" in diameter. From this army of wheels you can select one custom built for your job.

AMERICA'S HEADQUARTERS FOR MOUNTED WHEELS SMALL GRINDING WHEELS

*Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry. You can bank on us.

TRY ONE—Tell us the kind of equipment, the job, and size wheel you want to try. We'll send it postpaid.

Catalog Mailed on Request

CHICAGO WHEEL & MFG. CO.
1101 W. Monroe St. Dept. TE Chicago 7, Ill.

TE-9

Send Catalog.
Interested in
☐ Grinding Wheels
☐ Mounted Wheels
☐ Send Test Wheel

Size.....

Name.....

Address.....

.....

LONG RUN ECONOMY ON SHORT RUN JOBS!

NEW CUTTER *by Super* BRINGS CARBOLOY TIPPED EFFICIENCY *to All Milling Jobs*

Now you can get the money-saving efficiency of a Carboloy tipped milling cutter for your short as well as long runs! Made with a cast alloy body and the minimum number of flutes necessary for the specific work it is to do, this cutter, developed by Super Tool engineers, can be sold at such a low price in comparison with old type carbide tipped cutters that it can be used economically on short run jobs and even general shop tooling.

But low initial cost is only one of its many economies! It does more work, better work—faster! Run it at machine capacity with feeds of .002″ to .005″ per tooth in cast iron and non-ferrous materials! Run it at surface speeds of 400 to 800 feet per minute with tooth loads of .0005″ to .0025″ in steel. That's performance that spells EXTRA ECONOMY!

This cutter is accurate! Its faster operating speeds mean less cutting pressure—less work distortion. Much of the heat produced is thrown off in the chip leaving only a portion to be absorbed by the work and the cutter.

Available in 3″ to 8″ diameters with 4 or 6 flutes for cast iron, brass, bronze, copper, aluminum, magnesium, and plastics. For steel, 6 to 16 flutes are used according to the diameter. Let us send you a descriptive folder giving more details including prices.

All sizes available for early shipment

SUPER TOOL COMPANY

Carbide Tipped Tools

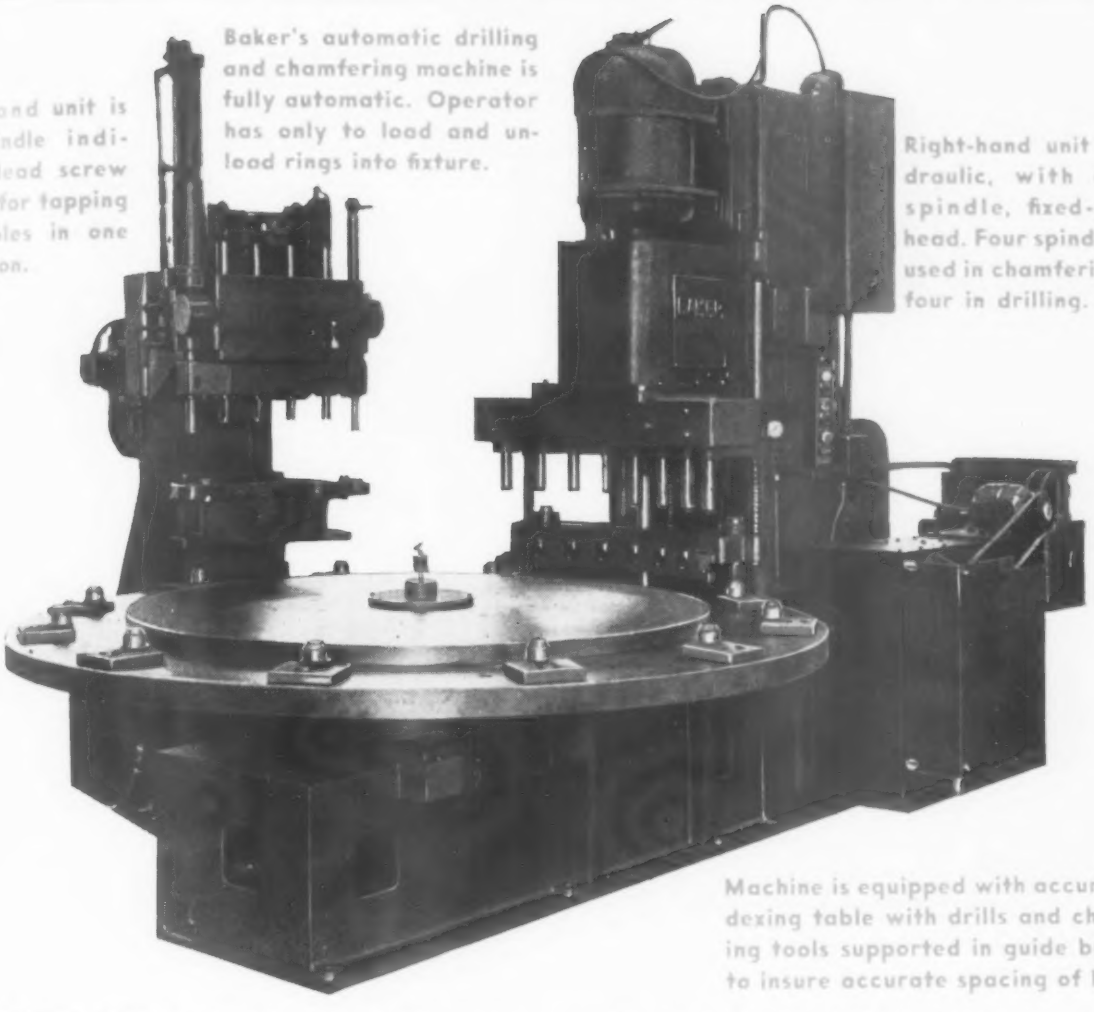
21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

BAKER BAKER BAKER ARMY E NAVY BAKER BAKER BAKER

Baker's automatic drilling and chamfering machine is fully automatic. Operator has only to load and unload rings into fixture.

Left-hand unit is four-spindle individual lead screw tapper for tapping four holes in one operation.

Right-hand unit is hydraulic, with eight-spindle, fixed-center head. Four spindles are used in chamfering and four in drilling.



Machine is equipped with accurate indexing table with drills and chamfering tools supported in guide bushings to insure accurate spacing of holes.

FLEXIBILITY is a chief feature of this special machine for drilling and chamfering holes in tank turret rings. The index table may be set for different hole spacings. The right-hand unit may be removed and equipped with a new head for other work. The pick-off gear head on the saddle of the hydraulic feed unit is arranged for speed change gears, allowing change of speed to the main driver in the gear head. Another feature is the reversing motor in the tap unit and individual lead nuts and screws to each spindle, insuring greater accuracy.

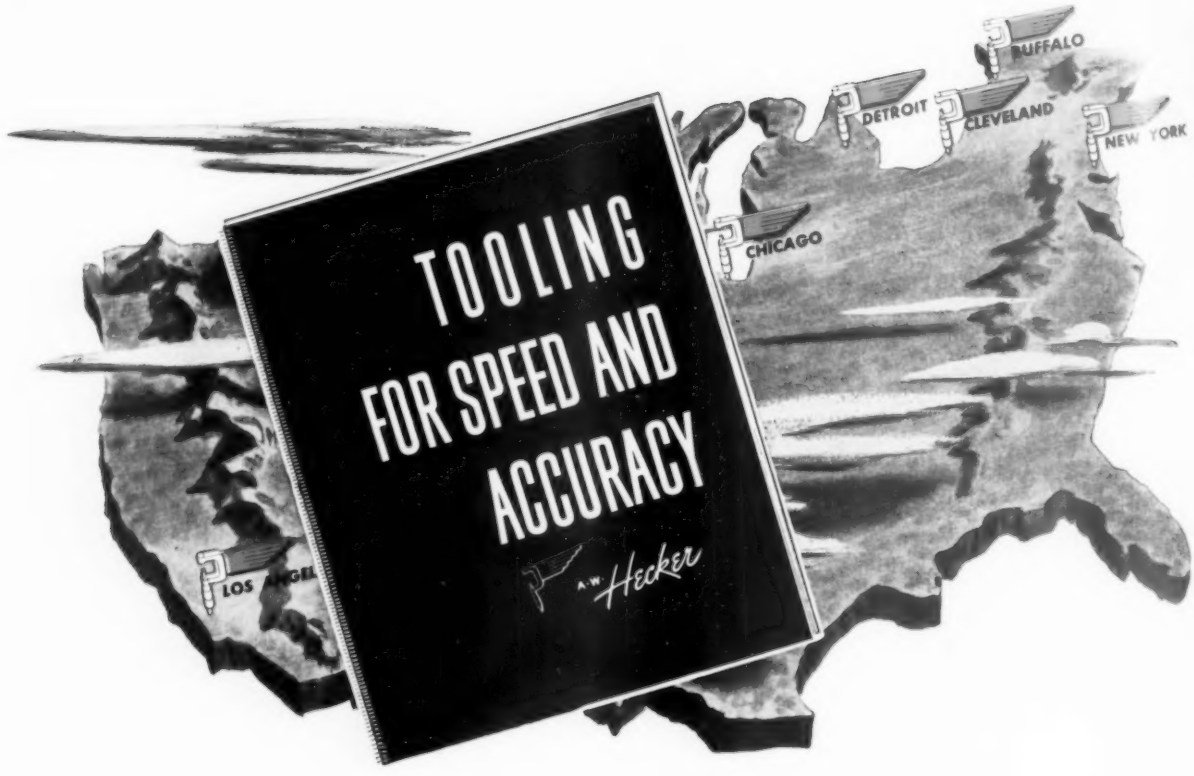
OUR MOTTO SINCE 1867:

"MACHINES STURDY AND EFFICIENT, AS FINE AS CAN BE BUILT"

Baker Brothers, Inc.

Toledo, Ohio

Machines for DRILLING • BORING • TAPPING • CONTOUR GRINDING



ask for this 7-MINUTE STORY

ABOUT A NATIONAL TOOL-ENGINEERING SERVICE

Here's the brief factual report of how the **HECKER** organization designs and builds production tools for many industries—both large and small.

Perhaps it suggests a solution to some of *your* tooling problems. If there's the slightest possibility of your needing outside specialized service on production tooling—make a request for your copy of this **HECKER** booklet to the nearest A. W. Hecker office (addresses below)—mention Dept. J.

A·W· Hecker

DESIGNERS AND BUILDERS OF TOOLS, JIGS AND FIXTURES—FABRICATORS OF AIRCRAFT PARTS

CLEVELAND, OHIO	NEW YORK, N. Y.	BUFFALO, N. Y.	DETROIT, MICH.	CHICAGO, ILL.	LOS ANGELES, CALIF.
1976 East 66th St.	1775 Broadway	443 Delaware Ave.	517 New Center Bldg.	332 So. Michigan Ave.	3723A Wilshire Blvd.

This letter will interest YOU!

"Regarding the type of work done on this grinder, we wish to advise that we are using it for a multitude of purposes. The main usage is in grinding the steam-tight joints on the lower and upper halves of turbine cases. This joint is a precision joint and must be ground accurately to assure steam tightness. We also use the grinder for the grinding of covering plates for oil reservoirs and other places where a smooth precision joint is needed to assure a gas or liquid tightness."

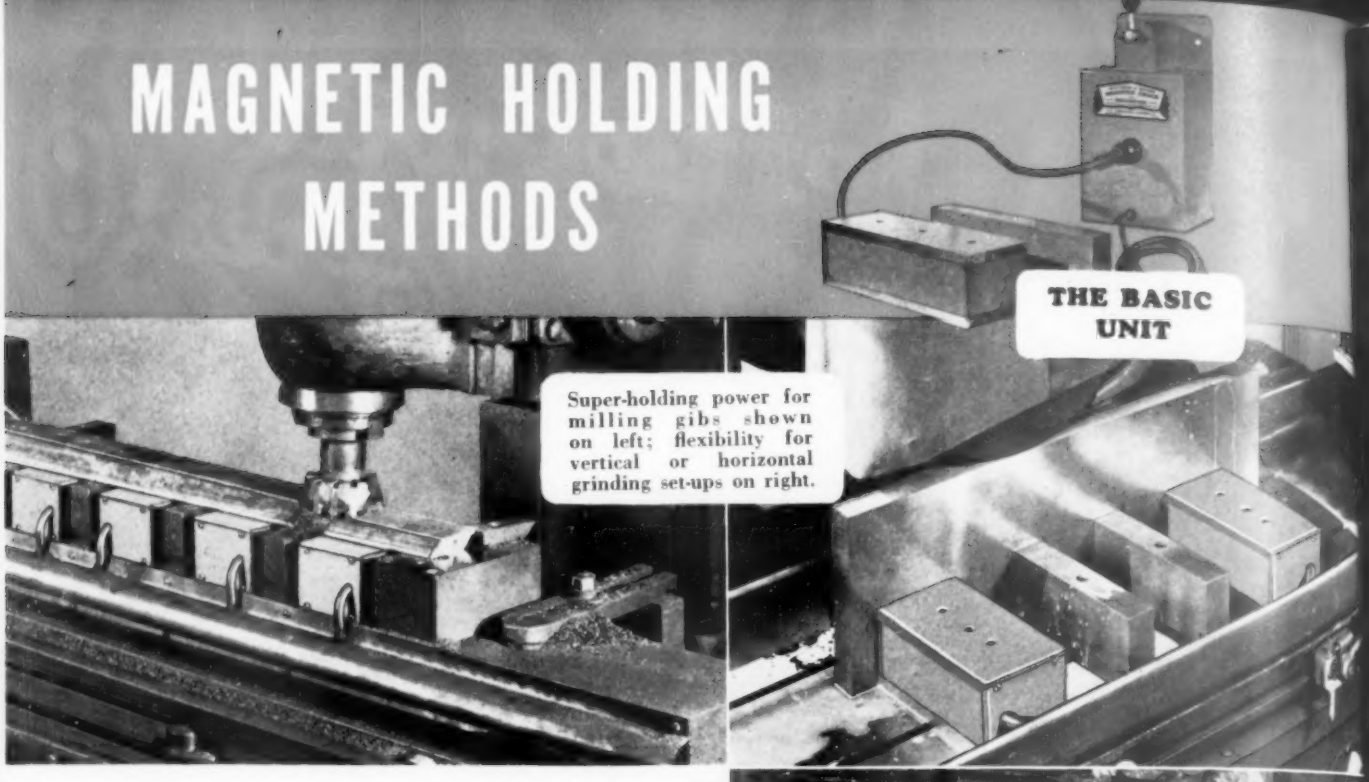
HILL Hydraulic Surface Grinders are built in both Horizontal Spindle and Vertical Spindle types in a full range of sizes with table dimensions 18", 24", 30", 36", and wider — and 5 to 20 feet long.

The

HILL ACME CO.

6400 BREAKWATER AVE. CLEVELAND, OHIO

MAGNETIC HOLDING METHODS



THE BASIC UNIT

Super-holding power for milling gibs shown on left; flexibility for vertical or horizontal grinding set-ups on right.

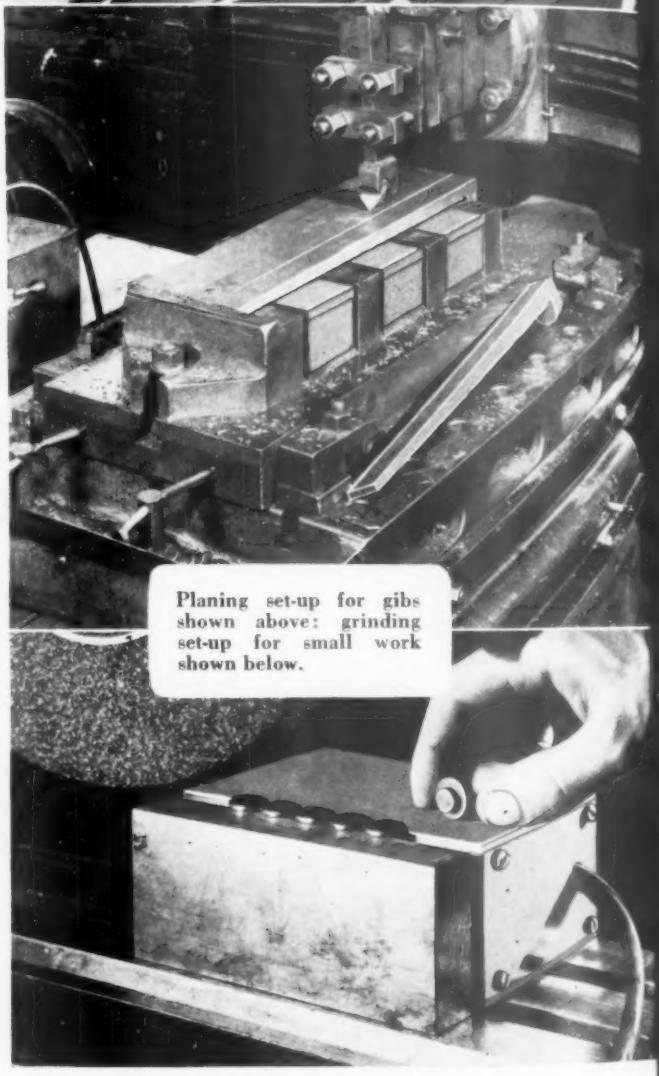
New Holding Applications

Methods engineers in many war industries have applied the ANDERSON & BROWN Magnetic Chucks with the "Body Flo" magnetic holding method to solve many tricky holding problems as well as speedy handling of work.

Many of these set-ups will not be disclosed until Victory is Won. However, you may learn now how ANDERSON & BROWN "Body Flo" Magnetic Chucks may be applied to solve your holding problems, to reduce or eliminate your cost of fixtures and to speed your production.

The basic unit, a precision instrument, may be applied to your surface grinders in the tool room and for production on your grinders, planers or shapers and for certain types of work on millers.

The application of two or more units, known as "Multiple Units", for large surface grinders, planers, etc., is now an accepted practice where more than the usual holding power is required.



Planing set-up for gibs shown above: grinding set-up for small work shown below.

GET THIS Super Power and Flexibility
Send for "Magnetic Chucking Revolutionized"

ANDERSON & BROWN CO.

2032 East 22nd Street • • Cleveland, Ohio

17 FEATURES

Recommend the Oster *"RAPIDUCTION JUNIOR"*

for a wide Variety of Bolt and Pipe Threading Work

1 **DIE-HEAD**..rotary type..fully adjustable.

2 **DIES** . . . segmental type . . . *high speed steel* . . . one or more can be replaced without renewing entire set.

3 **DIE RELEASE** . . . automatic, with emergency hand trip . . . dies reset to size automatically.

4 **STOCK STOP** . . . adjustable . . . automatic in operation.

5 **VISE** . . . open type . . . with hardened steel gripping jaws . . . quick acting and powerful.

6 **VISE CARRIAGE** . . . lever fed . . . heavily constructed . . . and mounted on 1¼" solid steel studs rigidly supported at both ends to maintain perfect alignment.

7 **MOTOR** . . . 2 H. P., 1800 RPM . . . totally enclosed in base . . . protected from dirt and chips.

8 **DRIVE FROM MOTOR** . . by V belts and motor and sheaves . . . eliminates noisy gears . . . prevents mechanical shock and sudden overload. V belts fully protected from oil and grease.

9 **WORM GEAR DRIVE** . . . hardened and ground steel worm running in BALL BEARINGS . . . bronze worm gear.

10 **MACHINE DRIVE SHAFT** . . . runs in BALL BEARINGS.

11 **SPINDLE** . . . hollow, for cutting threads of any length . . . semi-steel construction . . . runs in BALL BEARINGS.

12 **OIL PUMP** . . . easily accessible . . . insures full, uniform flow of cutting oil to dies . . . adjustable relief valve . . . pump shaft mounted in BALL BEARINGS.

13 **MOTOR CONTROL** . . . conveniently located . . . well protected.

14 **POSITIVE LUBRICATION** . . . oil level sight gauge makes it easy to keep oil at proper level to lubricate worm drive and all working parts which run in oil.

15 **BASE** . . . all steel . . . strongly braced for maximum rigidity . . . wide flaring pan prevents waste of cutting oil . . . keeps chips off floor.

16 **STEEL GUARDS** . . . easily, quickly removable for access to motor, pulleys, and oil pump.

17 **CHASER TRAY** . . . in base for convenient storage of spare chasers.

Oster "RAPIDUCTION JUNIOR" Threading Machines are made in two sizes: **No. 541** with regular bolt range: 5/16" to 1¼" N. C. or Whitworth and 5/16" to 1⅛" N. F. or B. S. F. **No. 542** with regular bolt range: 5/16" to 1½" N. C. or Whitworth and 5/16" to 1¼" N. F. or B. S. F. Both machines have a regular pipe or nipple range of ⅛" to 1¼". **WRITE FOR CATALOG LIST No. 23.**

OSTER *for faster, better threading*

THE OSTER MANUFACTURING COMPANY, 2063 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

Again Apex helps the users of Phillips Screws!

APEX announces a series of bit holders that absolutely revolutionizes the use of Power Bits and Hand Drivers for Phillips Recessed Head Screws. Here's what they do:

One Save you money after original installation of holders is made because they eliminate necessity of carrying so many different sizes of screw driver bits. Only item necessary to carry in stock is the insert tips. One range of inserts fits various sizes of holders.

Two Save vitally needed critical steel and release it for other war time users.

Three Increase bit life due to the float between insert and holder, allowing for easier direct alignment with recess in screw.

Four Decrease handling cost of screw driver bits because it is no longer necessary to return screw drivers for reconditioning as cost of inserts is approximately that of the reconditioning charge.

Send for Bulletin No. 102 giving complete details.

APEX

THE APEX MACHINE & TOOL COMPANY • DAYTON, OHIO

Manufacturers of Power Bits for Phillips, Slotted Head and Clutch Head Screws; and Hand Tools for Phillips and Clutch Head Screws.

SIEWEK

AN OLD NAME UNDER NEW MANAGEMENT

For more than a quarter of a century the name Siewek has stood for diligent engineering and precision workmanship. Now, under the impetus of new management, expanded facilities and larger capital, Siewek-built products will be more widely available to all industry. As a division of Domestic Industries, Inc., Siewek pledges a continuance of the high standard of quality which has characterized Siewek-built products and service in the past. Mechanized America deserves the best.

SIEWEK TOOL DIVISION

OF DOMESTIC INDUSTRIES, INC.
DETROIT (FERNDALE STATION)

Manufacturers of Rapid Clamping Drill Jigs, Automatic Fixture Locks, Progressive Shear Cut End Mills and Special Cutting Tools

SIEWEK ENGINEERING DIVISION

OF DOMESTIC INDUSTRIES, INC.
CHICAGO • DETROIT • HARTFORD

Designers and Builders of Jigs, Fixtures and Special Machines

CAPITAL AND SURPLUS IN EXCESS OF $7,000,000

More than . . . a printmaking process

WITH an Ozalid machine you make whiteprints direct from your engineering drawings in two fast steps—Exposure and Dry Development . . . the most simple method on record.

The Model B illustrated here is designed for large-scale production; turns out prints at speeds up to twenty feet per minute.

OZALID CUTS DRAFTING TIME

You can make design changes quicker with Ozalid.

Using an Ozalid transparent print of the original—it's never necessary for the draftsman to redraw any line which remains the same in the new design . . . it's never necessary to employ photographic equipment . . . or to otherwise throttle production.

Ozalid transparent prints are made in the same manner as standard prints—without Van Dyke tieups. Think what this means considering the number of design changes you're making today—the number you'll be making in the postwar period.

Be sure of a "head start" with Ozalid!

OZALID GIVES THESE EXTRA VALUES

Most Versatility

You can do much more with Ozalid. You can make prints of your engineering drawings, charts, and letters which will have blue, black, or maroon lines on a white background. You can make prints on standard, transparent, and foil materials.

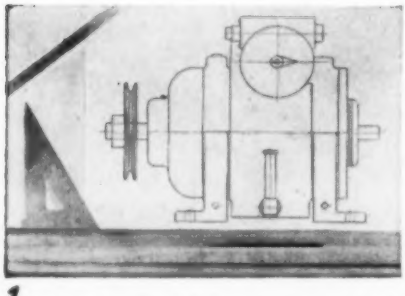
What's more—all Ozalid materials are available in cut sheets, as well as roll stock; thus, by using sheets the size of your originals you can completely eliminate trimming waste.

Low Maintenance Costs

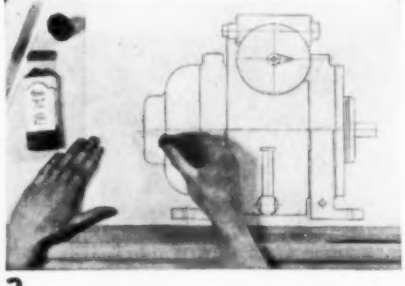
Any inexperienced person can operate an Ozalid Whiteprint Machine. There's never a labor problem, because Ozalid's Dry Development has simplified printmaking—eliminating the liquid baths, the driers, the plumbing connections which demand skilled supervision.

Another result of Ozalid's Simplified Printmaking is low electrical consumption. The Model B, operating at maximum speed, consumes only 4.4 kilowatts.

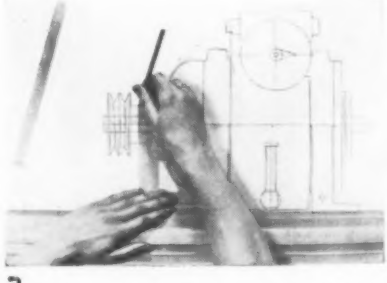
Ozalid Whiteprint Machines are designed for large-scale, medium, and occasional print production . . . and there are dry developing units for those having a suitable printer.



1. This is an Ozalid transparent print of an engineering drawing—part of which has to be changed.



2. The draftsman quickly eradicates the obsolete lines with a quick-drying corrector fluid.



3. The new design is drawn in . . . the desired number of prints can be made from this transparent copy.

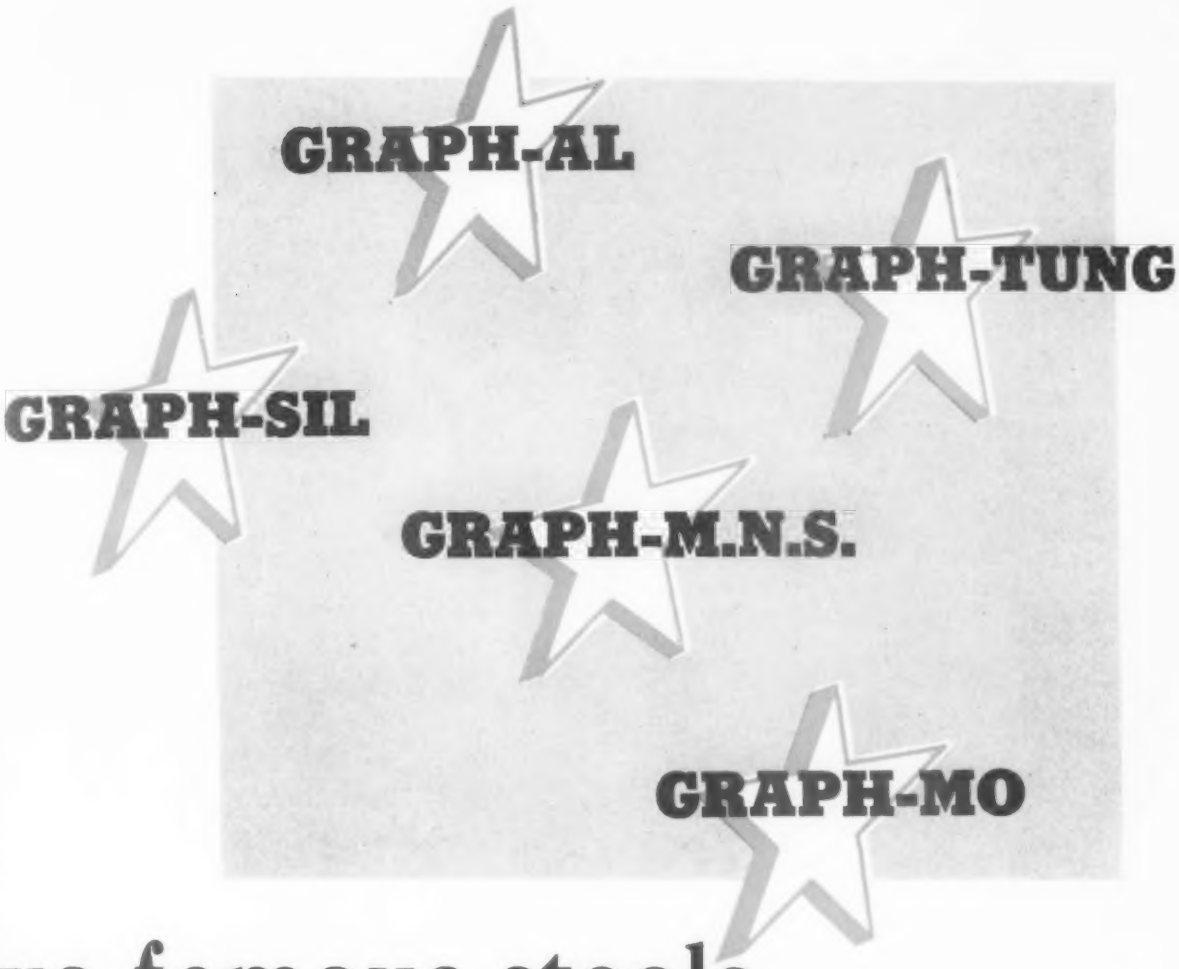
OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

Johnson City, N. Y.

OZALID IN CANADA—HUGHES OWENS CO., LTD., MONTREAL

WRITE FOR CATALOG . . . and sample booklet of Ozalid Whiteprints. See how leading manufacturers save time, labor, and materials with Ozalid.



five famous steels

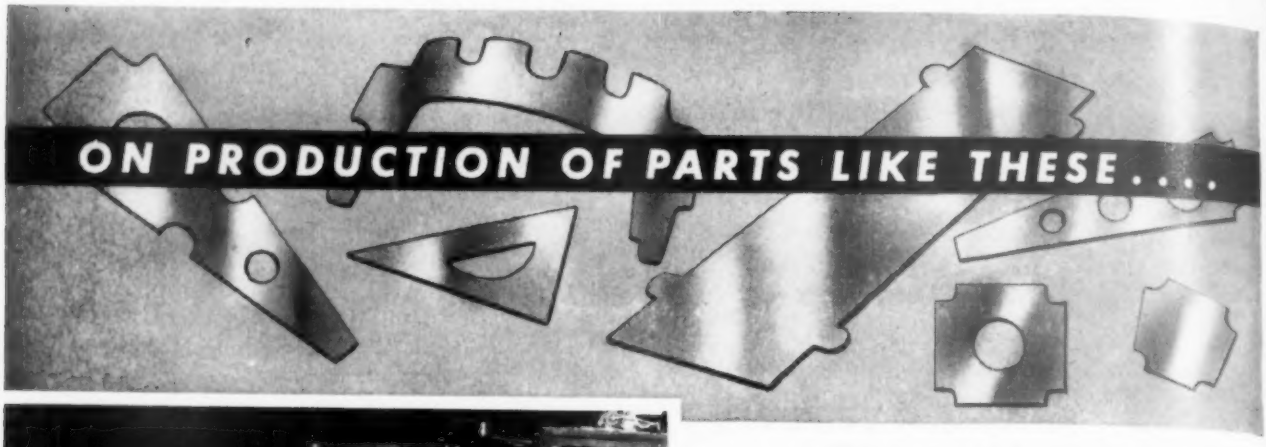
The five Timken Graphitic Steels — Graph-Al, Graph-Sil, Graph-Tung, Graph-M.N.S., and Graph-Mo — offer *faster machining, exceptional resistance to wear and less tendency to score work.* These qualities, plus their uniform structure, high physical and excellent heat treating properties, combine to make them truly exceptional. Because each steel has been designed to do a specific job, it will pay you to investigate the possibilities of one or more of these "famous five" for your tool shop. A Timken metallurgist will be glad to consult with you. Steel and Tube Division. The Timken Roller Bearing Company, Canton, Ohio.

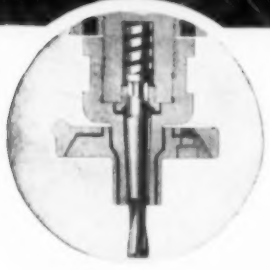
CRITICAL ALLOYS DO NO GOOD

as unwanted residuals in plain carbon steel . . . yet millions of pounds of vital nickel, chrome and molybdenum are lost each month in this way. Keep your alloy supply coming—help win the war — by segregating scrap.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS

for faster machining-longer wear

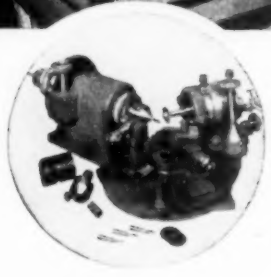




Patented Taper Chuck

This new Onsrud chuck design eliminates long over-hang and increases chucking grip. Close chucking gives the bit increased rigidity, eliminating all "whip" and reducing bit-breaking vibration.

Because the Inverted Taper Shank Bit used is always perfectly centered and correctly chucked, life of bits and spindle bearings is increased. The over-all result is faster, smoother cutting, easier feeding of bit, and less operator effort to do the work.



Onsrud Spiral Bit Grinder

With the GF-41 Spiral Bit Grinder, spiral router bits with straight or taper shanks are sharpened speedily and with factory-like accuracy and precision in your own shop.

In operation, bit is held in chuck and moved to and from the grinding wheel by a hand lever. Cam provides proper bit lead. Entire motor assembly swivels for correct adjustment to any grinding angle.

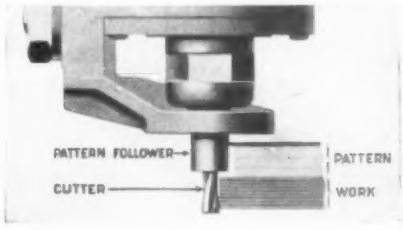
Full details on this high-speed, air-powered unit sent on request.

THIS TRIO SAVES TIME—LABOR—MATERIAL

High speed production routing of irregularly-shaped non-ferrous parts is possible with the three Onsrud products described here.

The Onsrud Radial Arm Router has a spindle speed of 15,000 RPM for smoother, faster routing of both inside and outside cuts. Completed work has clean, finish-smooth edges.

Onsrud machines and tools pioneered high speed, fast feed working of non-ferrous material. It will probably pay you to get the help of Onsrud engineers in solving your problems. Write today for "Tricks and Tips on Radial Arm Drilling and Routing" and for further information on Onsrud methods and how they may be applied to your operations.



Here's how the Onsrud Radial Arm Router cuts parts from stacked, flat or corrugated sheets. A pattern is fixed to the sheets and the pattern follower travels along the pattern's side. Both inside and outside cuts are made accurately and speedily.

ONSRUD MACHINE WORKS, INC.

3927 Palmer Street Chicago, Illinois

Sales Offices in all Principal Cities

Machine and equipment illustrated fully protected by patents numbered 2-280-299, 1-991-623, 469-158, 474-357 and patents pending. All infringements of our rights will be diligently prosecuted.

MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

PULL HERE
HOLD HERE
DOALL
PRECISION SAWS
FOR CONTOUR SAWING OF ALL METALS AND OTHER MATERIALS
FASTEN LOOSE END UNDER CLIP
IMPORTANT
To get best results use the correct saw and the correct cutting speeds for each job.
Consult a DOALL "Job Selector Dial" or Saw Booklet.
TESTED AND GUARANTEED
USE OF DOALL
PRECISION BAND SAWS
REMAINING STOCK
LOOK FOR THE TRADEMARK
THE DOALL CO.
DES PLAINES, ILLINOIS, U. S. A.

"I'll Take This One"

● And with a DO-ALL Saw in his hand, he's making a good choice, because DO-ALLS are up-to-the-minute, hard-toothed and will increase cutting efficiency to an amazing degree.

No matter what you saw—metals, alloys, plastics, magnesium, aluminum, plywood, laminated materials, builders board, rubber, wood, etc. — there's a DO-ALL Saw specified for that material. No hit or miss, the right saw for the job, every time.

These Band Saws, first designed to fit DO-ALL Contour Machines, are now available for most any sawing machine. 100 feet in each metal Strip-out box.

Send for new DO-ALL Band Saw circular.

FREE LABORATORY TESTS

The DO-ALL Research Laboratory is at your service. Send your tough cutting problems for the DO-ALL engineers to solve. You'll receive promptly a written report of their findings and recommendations.

THE DOALL COMPANY

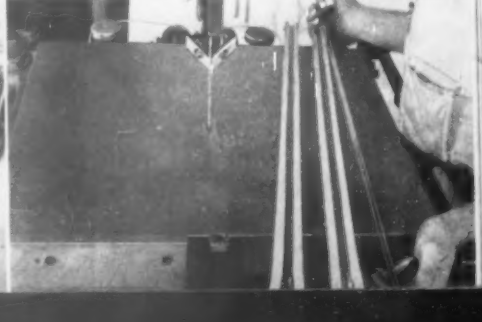
1211 THACKER STREET DES PLAINES, ILLINOIS

DO-ALL Offices in 25 cities, with a staff of trained engineers to give you quick service on Band Saws and Files, Contour Machines, Gage Blocks and Surface Grinders.

MER DIE—Used to trim forgings to size. mmended to this Ohio firm the use of a 10- ¼" wide DO-ALL Saw. Running at 150 the job can be done in 1 hour, 40.6 minutes.

SHEET FORM CASTINGS—One piece 21 x 20" the other 24 x 20", both ⅛" thick, sent in by a railroad. Recommended they use a 14-pitch ½" wide DO-ALL Saw. Run at 150 f.p.m. both pieces can be finished in 9 to 10 minutes.

MACHINE GUN BARREL—Sent in by motor firm doing war work. It was found the best way to split these 50 caliber barrels 36" long, for inspection, was to use a 6-pitch, 1" wide DO-ALL saw and reduce velocity to 90 f.p.m. Cut in 51 minutes.



A New PROFILOMETER*

MORE COMPACT
EASIER TO USE
SIMPLIFIED CONTROLS

Shown above is the new Type Q Profilometer closed for carrying. At the right is the instrument ready for use. The lid on the upper section is folded back showing the convenient compartments which hold the tracers, Flexarm and glass specimen.

Over the past few years, Profilometers have proved their value as instruments which provide extremely accurate, useful measurements of surface roughness. In hundreds of plants, they have been in constant use in production and inspection departments—often without interruption 24 hours a day.

With the introduction of the Type Q Profilometer these instruments will prove even more useful. The principal improvements in the new model are listed at the right. In addition, with the various Profilometer tracers and other accessories now available, there is scarcely a surface that cannot be checked quickly, accurately and conveniently with the Profilometer.

WRITE FOR FULL INFORMATION

The Type Q Profilometer offers these improvements:

- Lighter and smaller. It is more portable and can be used more conveniently wherever it is needed.
- All Profilometer tracers are now adjusted to the same calibration number so that adjustment of amplifier in field is no longer required. This makes possible fewer instrument controls and eliminates possibility of calibration errors on part of operator.
- Compartments for Type M Tracer, Flexarm, Glass Specimen, Type I or J Tracer. Power and Tracer cables, attached to Profilometer, are stored in compartment in front of panel.
- Meter panel set at forty-five degree angle for easy reading. Operator can use Profilometer while seated.
- Designed for use on 115 or 230 volt 50-60 cycle power lines.

**Profilometer is the trade name registered in the U. S. Patent Office by Physicists Research Company.*

PHYSICISTS RESEARCH COMPANY

Manufacturers of Electronic Production Gaging Instruments

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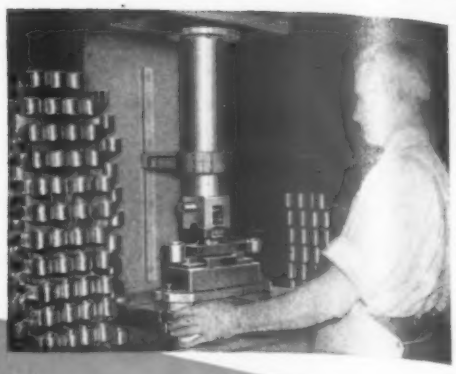
Uniform marking insured by the design of this hydraulic press



This Hannifin hydraulic marking press being used for stamping numbers on aircraft engine connecting rods makes full use of the advantages of hydraulic operation. Smooth application of pressure, with a uniform maximum and automatic reversal of the ram, insures uniform marking of successive pieces, compensating for small variations. An easily adjusted control of maximum ram pressure simplifies the handling of a variety of work. Ram stroke, is also adjustable, to avoid unnecessary up-travel, saving time and power in production operations.

This is but one example of the many Hannifin hydraulic presses being used in modern manufacturing operations by producers of aircraft, machine tools, military vehicles, and armament. Fast, accurate production is the natural result of Hannifin experience in the design of standard and special hydraulic equipment.

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HANNIFIN *Hydraulic* **PRESSES**

PRODUCTION PERSPECTIVES

T.M. REG. U.S. PAT. OFF.

War Production: For the third time output has hit a plateau. First and second causes were machine and material shortages. Now it's manpower....Gains in June production: aircraft, 3 per cent; combat vehicles, 2 per cent; small arms, 14 per cent; and merchant vessels, 11 per cent. Decreases: self-propelled artillery, 13 per cent; other artillery, 7 per cent; naval vessels, 3 per cent....Production must rise 30 per cent for remainder of year to meet the sky-high schedules.

Manpower: Production will not rise substantially until more workers are found, more output per worker is attained....Legislation is the inevitable solution to the first problem. Watch for it this fall....Incentive pay systems may solve the second. Production men tell Tool Engineer Editors they are really worried about current drop in individual worker output. Incentive pay, if organized labor will cooperate, appears as only solution. Packard Motor boss, George T. Christopher, tells us it would boost their airplane engine output 20 per cent.

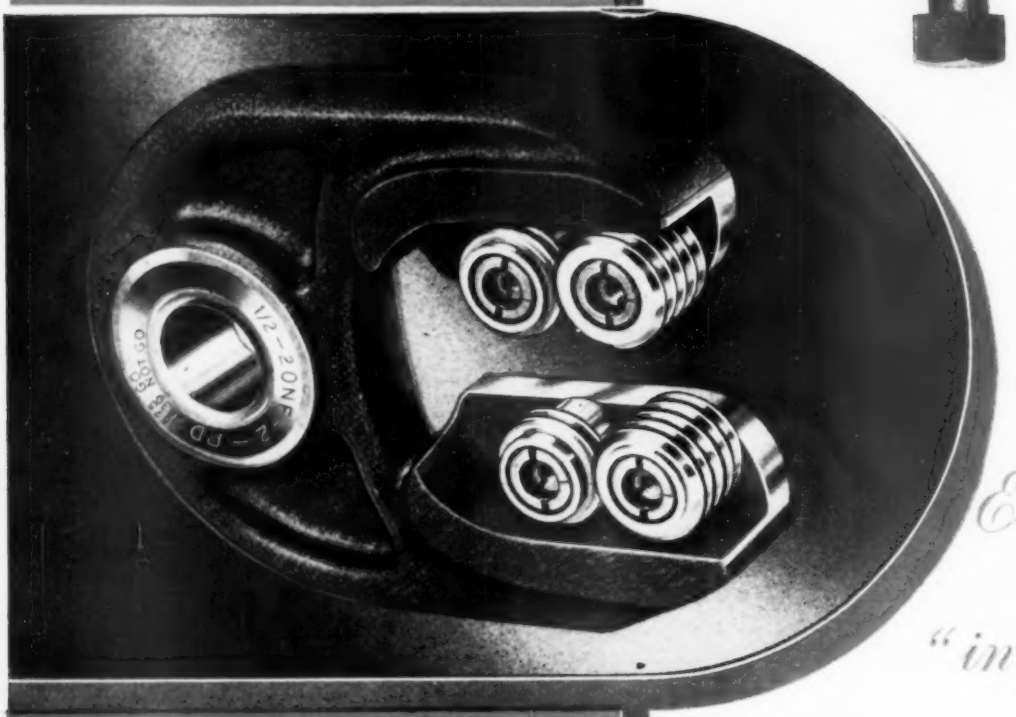
Hot Spot: Most encouraging July production front news was record output of 7,300 military planes. Production of heavy bombers was up 13 per cent....Aircraft Outlook: At half-year mark only 40 per cent of scheduled goal was attained. West Coast builders say they cannot make substantial gains until 600,000 additional workers are provided....Shipbuilding: 1,046 vessels were delivered in the first seven months of 1943, equal to total American ocean-going merchant marine before Pearl Harbor. Outstanding job of meeting schedules has been made by shipbuilders....It still happens: One Great Lakes shipbuilder, pushed by Maritime Commission for big ore boats, is waiting on pumps. Reported reply from pump maker: WPB had ordered the allocated equipment shipped to a Washington, D.C. hotel for air-conditioning system....Manpower, not materials, is deterrent to increased ship output.

Post-War Detroit: Production men in the industry, talking with Tool Engineer Editors reveal this thinking....Biggest problem will be getting government machinery out of plants....Current planning is on ways of reducing anticipated six months required for retooling....Higher labor costs will be compensated by new materials handling and processing to eliminate manpower....Few new standard machine tools will be needed. Demand will exist for specialized machinery. They admit, however, that thousands of their machines are antediluvian....Tool builders will have to effect radical improvements to stimulate sales appeal.

Machine Tools: Unofficial industry survey shows July shipments of $98,000,000, contrasted to June shipments of $108,689,000 announced by WPB. Same survey shows July orders approximating $38,000,000. Final figure may be nearer $31,000,000 after cancellations and adjustments....WPB is more responsible than lack of buyer demand for drop in orders. Builders know certain machines are badly needed but have not been ordered because of WPB red tape and investigations. Last month the National Machine Tool Builders took steps to clarify buyer understanding of WPB directives. Result: Downward sales curve was broken in late August.

Good Job: The auto industry has worked itself out of one job. Carriage-trade work before the war, tank manufacture was placed on a mass-production basis by automakers. Now, only two, Fisher and Chrysler, are still producing. They are tapering off. Only one locomotive builder is still on tanks....Civilian Output: Watch for approval on production of 1,000,000 trucks next year. Detroit expects a "go ahead". As trucks will be heavies, gear cutting facilities will be taxed.

NOW - YOU CAN GET



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The Roll Thread type of Snap Gage is ideal for gaging work on the machine. Its open end construction permits rapid application of the gage to the threaded part. The rotating rolls increase the life of the gaging ribs and the effective life of the gage.

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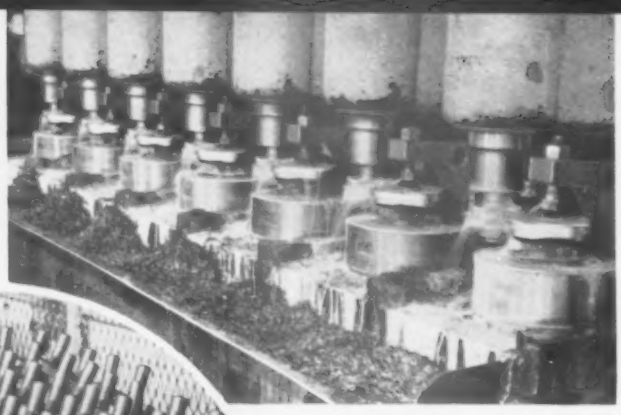
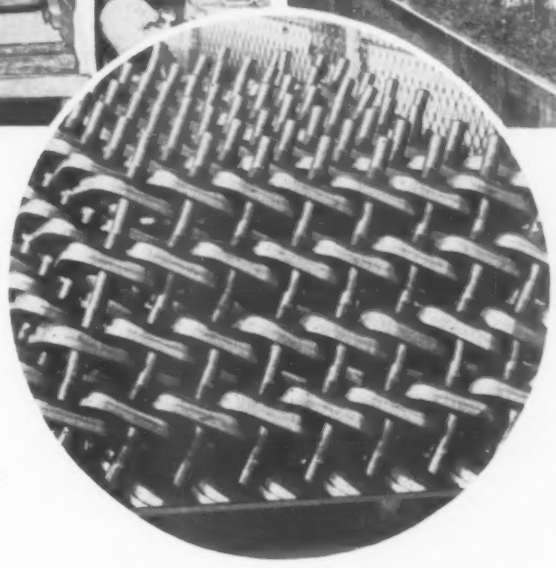
TAPS . . . DIES . . . GAGES . . . TWIST DRILLS . . . SCREW PLATES

Handhole milling fixture provides patterns for individual cutter travel.



Close-up of the handhole plate milling machine. Note workpiece spindle.



Right:
Handhole plates are now being mass produced.

GERALD ELDRIDGE
STEDMAN

CAMS CONTROL 7-SPINDLE MILLING MACHINES

MASS ASSEMBLY of ships would have been impossible without mass production of parts. Such parts were once within the province of only the jobbing shop. Before war, so few orders were expected for some parts that no practical engineer bothered his imagination with tool design for mass producing them.

How the demands of war contracts were met is typified in the design of multi-spindle milling fixtures for machining irregularly shaped handholes and handhole plates, used in sectional header boilers.

In Chattanooga, the Hedges-Walsh-Weidner plant, a division of the Combustion Engineering Company, is mass producing sectional header boilers, along with other marine steam generating equipment, for Liberty ships and Navy destroyer escorts. There are headers in sequence in this type boiler, each of which has a handhole which has been burned, finish machined and supplied with handhole plates and fittings.

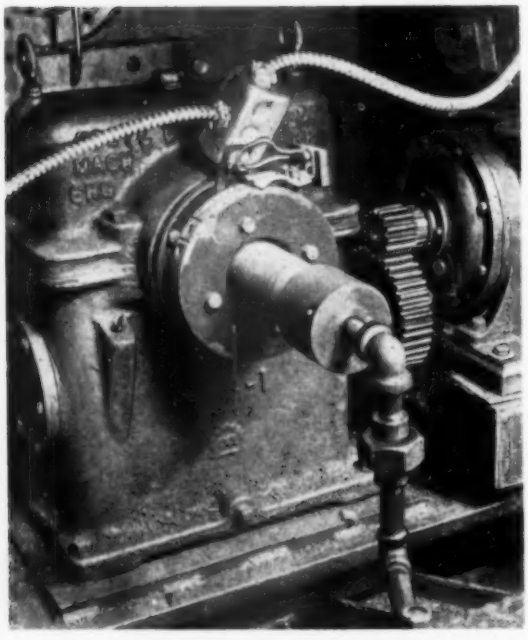
Handholes permit inspection, cleaning and renewal of tubes through the header. They range in shapes and sizes from ovals 2-½" by 2-⅝" to elliptical, diamond and rectangular shapes measuring 4-13/16" by 5". The holes are machined on the periphery and faced on the back side to form the seat for the gasket between handhole plate and header. The forged steel handhole plates are milled on the flange to a true plane and shouldered to center on the inside of the header openings. The plates are secured over the handhole by riveted studs, nuts and forged steel yokes. For high pressures, forged plates with integral stems are used.

Handling awkwardly shaped boiler header was reduced by new milling fixture.

Two operations previous to the application of the milling fixtures are worthy of brief consideration. First, the sinously shaped header, in which the handholes are arranged in a staggered pattern, is forged with accuracy that permits location of handholes with jigs fitted to the header contour. Second, the holes are flame cut on a multiple torch machine, controlled by a pattern. Fourteen torches operate

Southern war plant designed multi-spindle mills to finish machine odd-shaped forgings that were once considered jobbing shop items

Close-up of pattern which guides seven work spindles on handhole plate machine.



Above, the electric timer on handhole milling machine. Below, hydraulic work holding clamp on plate milling machine.

simultaneously, leaving 1/8" stock for finish milling.

As for the actual milling job, when war production began, manpower, floor space and machines were not available to permit line production with single spindle machines. Thereupon Fred J. Krause, assistant general manager of the Combustion Engineering Chattanooga plant, and his associates designed and successfully superintended the construction of two entirely original machine tools. One is the multi-spindle handhole milling machine, the other, the multi-spindle handhole plate milling machine. Four of the former and two of the latter machines, in full operation, are meeting requirements completely.

The seven spindle handhole milling machine is controlled by three patterns and a variable hydraulic eccentric with feed control automatically adjustable to the amount of stock removal required by changes in contour of the work. The main features of this machine tool are: (1) pattern and compound slide, (2) variable hydraulic eccentric, (3) automatic feed control, (4) individual spindle heads and cutters, adjustable to any center, (5) single motor drive, (6) single coolant pump supplying all spindles, (7) work-holding fixtures.

The three patterns are of hardened tool steel, being of the exact shape and size of the holes to be reproduced. These patterns are mounted rigidly by means of cap screws and dowels on the vertical member of the compound slide. Rollers working within these patterns control the movement of the work piece assuring true radii and precise line milling.

The rollers are of hardened tool steel, ground to the same diameter as the cutters. Cutters are always ground in steps of .005" until they they have been ground down to sizes no longer usable. Each machine has a series of rollers that are stepped down in companionate diameters of .005". After each cutter sharpening, rollers are changed to the equivalent step-down assuring an accurate relationship between follower and cutter. This is a great improvement over older systems where changes in cutter size tended to increase the error as cutter sizes decreased from the dimensions which the cam was designed to accommodate.

The use of a single pattern on the multi-spindle machine was first considered. It was decided, however, that any lost motion in the compound slide might cause error in the milled holes because of the possibility of carrying this lost motion to one end of the machine or the other. Three patterns were then incorporated in the machine design. These give a three point bearing in any direction, eliminating any possible error which might be caused by lost motion in the slides.

The hydraulic eccentric, uniquely engineered, is mounted on the bearings in the machine base. The bearing to which this eccentric transmits motion is mounted on the vertical compound slide to which the patterns are also attached. The eccentric keeps the pattern forced against the rollers which are mounted on the machine base that carries the milling spindles. The hydraulic equipment is powered by an all-gear type pump developing approximately 500 psi. The eccentric makes one revolution to finish the hole. It governs the size of the hole as well as actuating the rate of feed.

TIMER CONTROLS FEED

The rate of feed is controlled by means of an electric timer which actuates a thruster that in turn controls the speed of the hydraulic eccentric through a variable speed reducer. The variable characteristic in cutting is necessitated by contour changes, particularly small radii.

The seven individual heads are horizontal, individually housed, driven by worm gears. Each head is driven from a common motor, the drive off the line shaft being by V-belt to the worm shaft. The centers of the heads are adjustable for different spacings, the minimum center distance between spindles being 12". Cutters are mounted in clusters, so that both hole and gasket seat are machined simultaneously.

Coolant is supplied by a single pump with individual feed lines to each cutter. Soluble cutting oil is used for the low carbon steel.

Work-holding fixtures are mounted and bolted on the vertical slide, work being located in the fixture by stops, locating pins and lugs. The acetylene flame-cut holes which have been located from the contour of the work, act as guides for proper location relative to the milling cutters.

Plates having the same variety of shapes and sizes as the handholes, are milled on three surfaces, the shoulder which fits into the handhole, the gasket seat and the outer periphery. The

plate milling machine has seven spindles, controlled by a single pattern which governs individually driven spindles and seven synchronized work-holding spindles which are hydraulically clamped and actuated by a semi-hydraulic feed mechanism. Main features of this milling machine are: (1) seven milling spindles, (2) seven workholding spindles, (3) pattern and its mounting, (4) feed mechanism, (5) hydraulic clamping, (6) milling spindle drives, (7) work spindle drives.

The seven vertical milling spindles with individual motor drives are adjustable in a horizontal plane for variation in size of work to be milled. Individual spindle drives incorporate V-belts and gearing.

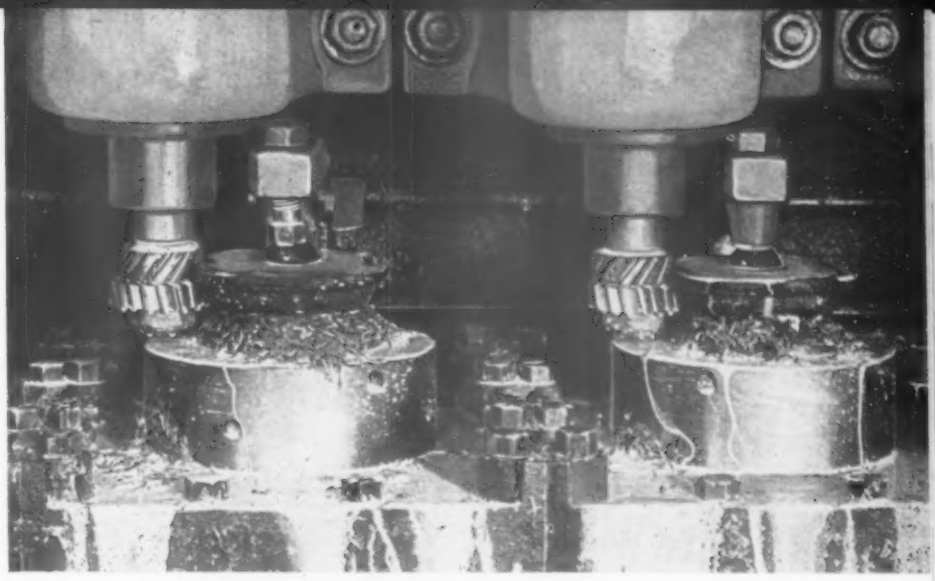
The seven work-holding spindles are vertical, equipped with suitable chucks to hold the work. Individual chucks for each change of shape or size of plate provide loading and discharge of work. The drive for the work-holding spindles is through worm gears. The worms are integral on a common shaft. This assures perfect timing for machining odd shapes in multiple from one cam pattern.

PLATE MILLING PATTERN

The pattern for the plate milling machine is hardened tool steel of exact shape and size as the work when finish milled. It is mounted on the left hand of the last work-holding spindle of the machine, on the end opposed to the work-holding chuck. The work-holding spindles are mounted on a slide which tracks in V-grooves that have been scraped and gibbed to take out any lost motion.

On the left hand end of the main frame or base, in which the slide operates, there is mounted a housing, containing a ball bearing spindle on which is mounted a hardened tool steel tracer roll which contacts the pattern. As on the handhole milling setup, rollers are supplied in sizes to match cutters. The largest size roll is equivalent to that of a new cutter which is 3″ diameter. They range downward in steps of .005″ to the equivalent of the smallest size to which a cutter can be economically ground. The cutters on all seven spindles are changed at the same time, at which time the roller of identical diameter to the newly ground cutter is placed on the spindles.

The pattern is held against the tracer roller by means of a hydraulic cylinder mounted on the right hand end of the machine. This cylinder is mounted rigidly on the bed plate, its piston actuating the slide. It operates under 500 psi. As the pattern rotates, the hydraulic pressure keeps the pattern against the roller.



Close-up of cluster cutters on two of seven spindles on handhole plate machine.

The hydraulic clamping is done by means of an arm or fulcrum, one end of which is placed on top center of the work to be milled; the arm being forced downward on the opposite end by pressure from a small hydraulic cylinder. These are individual hydraulic clamps. Clamping the work on top center permits rotation of the work past the milling cutters. This rotation, together with the movement of the slide, results in feeding the work to the cutter.

The cutters are cluster type. The smaller cutter of the plain milling type machines the outer periphery. The cutter which machines the shoulder and gasket seat is of a half side-mill of larger diameter, the difference in diameter between the two depending upon the width of the gasket seat required. Tolerances are held to predetermined requirements.

The cutting lubricant for this machine is a soluble cutting oil which is fed into the machine through a single electrically driven lubricating pump and piped to the individual cutters.

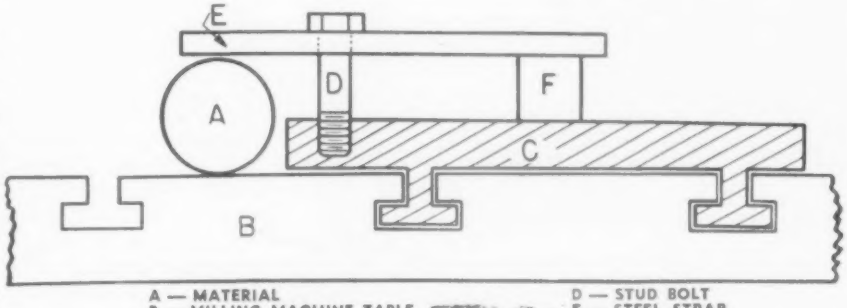
THE END

DEVICE HOLDS SMALL WORK ON LARGE TABLES

•

A device for securely clamping material of smaller diameter than the space between the T-slots of large milling machines has been devised at General Electric's Schenectady Works.

As shown, a steel plate "C" with two T-shaped projections which fit the grooves of the miller table. A tapped hole receives stud bolt "D". By tightening the bolt down on block "F" and the work "A", the work is held firmly for machining.

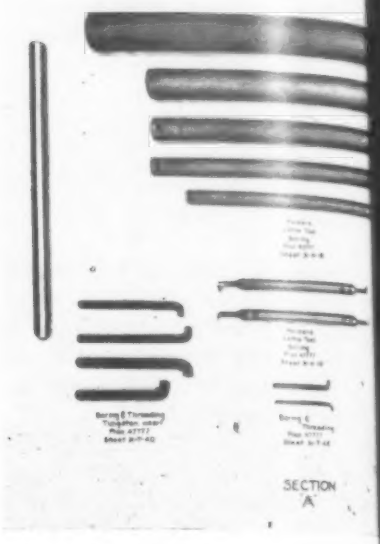


A — MATERIAL
B — MILLING MACHINE TABLE
C — HOLDING DEVICE
D — STUD BOLT
E — STEEL STRAP
F — BLOCK

CENTRALIZED TOOL CONTROL at Puget Sound Navy Yard

By making a single department responsible for all tool distribution and maintenance, this big Navy shipyard has lengthened tool life and stepped up production

W. E. AINSWORTH



TOOL RESPONSIBILITY is divided when machine operators grind their own tools, and the efficiency of a tool will vary with the workman's skill in grinding. Moreover, to the workman who grinds only a few tools a day, the amount of material removed, time involved, or performance obtained may seem unimportant compared to his primary job.

In a central tool shop, attention to these factors is a major objective. Using special fixtures, or machines purchased to provide a uniform grind, the shop furnishes the best possible tool in the least amount of time.

Extensive employment of centralized tool control is proving a success at the Puget Sound Navy Yard. Unnecessary duplication of duties has been eliminated, tools are more readily available, and production equipment is accorded the treatment it deserves. To accomplish all this, a service organization has been developed and is operated under the supervision of the shop superintendent.

The central tool shop is custodian of all loose, hand, and portable power tools in the industrial department. It is responsible for their upkeep, storage, issue, salvage and accountability. When necessary, it actually manufactures tools. This improves efficiency because it permits production shops to concentrate their efforts upon the job at hand.

Among the most important advantages of centralized tool control is increased production through longer tool life. This is made possible by keeping records of performance and maintaining the equipment and personnel necessary to duplicate any type tool. A further advantage is that fewer tools are idle, permitting inventory to be held at a minimum with tools being transferred from one tool room to another as required.

The functions of the various groups in the central tool shop are made more apparent by a study of each separate division.

TOOL AND DIE MAKING AND REPAIR

The tool and die shop includes a tool design section which makes sketches of all special tools and fixtures. It is also equipped to manufacture gear hobs, taps, broaches, drop forge dies, plastic mold dies, blanking and sheet metal forming dies, and various other tools that may be required for building or overhauling ships. Standard tools are purchased and only tools of a special nature are made in this Navy Yard.

A large variety of cutting tools is made with low grade carbon or alloy shanks and with inserted cutting tips or blades of carbides, cast alloys, or high speed steel (Figure 1). Inserts

Tools properly ground and adjusted do a better job and give longer service.

Critical Cutting Tool Shortage Makes Tool Care Imperative.

●With approximately 10,000,000 war workers, many of them inexperienced, using cutting tools, supply has lagged behind demand until deliveries now are four months behind schedule.

Throwing its weight behind the tool conservation campaign sponsored by WPB and the National Industrial Advertisers Association, The Tool Engineer presents the accompanying story on tool control.

The tool conservation measures outlined have broad application. Here is evidence that centralized control is necessary and will prove profitable in any shop where heavy demands are made on cutting tools.

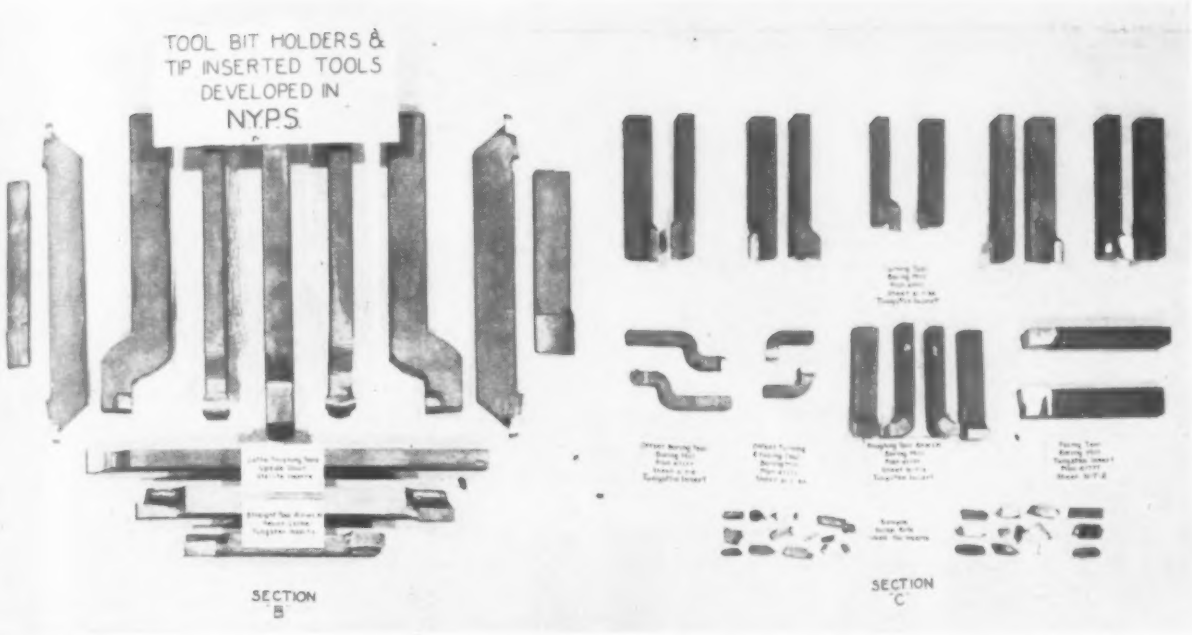


FIGURE 1. Tipped cutting tools and holders developed at Puget Sound Navy Yard include high speed steel bits welded to low carbon steel shanks. Holders are constructed by milling a square slot in the shank and cap, and welding the two sections together with atomic hydrogen. Shown above is a portion of a cutting tool display board.

are held in place by several methods, including clamping, cementing, brazing, or atomic-hydrogen welding, the method selected depending upon design of the tool and its use.

Many multi-point cutting tools, such as reamers, countersinks and special milling cutters, are made in this same manner and have increased production far beyond that received from the solid high speed steel type (Figure 2).

The tool and die department is responsible for tool salvage. Among items salvaged are high speed steel threading chasers used in geometric type die heads. Dies, worn or damaged beyond further use, are reconditioned by removing the original threads and grinding new threads of a larger diameter. This is accomplished without annealing. Grinding is done on a thread grinder with an attachment developed at this Yard (Figure 3). Dies that become too short for recutting are inserted as cutting tips on lathe and planer type tools.

Tool salvage contracts with outside contractors are utilized to a maximum. In many cases where tools have lost their effectiveness through continued grinding or have become damaged, they are restored to usefulness as a smaller size tool of the original type or made into some useful tool of another type.

TOOL GRINDING

Tools that need grinding are delivered in special containers to the central tool shop from the various tool rooms throughout the Yard. The containers are constructed to hold tools in position without injury to the cutting edges (Figure 4). Each container is marked with its tool room number and is fitted with a reversible cover which is marked DULL on one side and SHARP on the other. Thus, the box of tools is easily identified and no tags are required.

All tools are machine ground, which holds the material removed from the tool to a minimum and makes possible close control of the amount of clearance on the cutting edge. Clearance is measured by the indicator method, rather than by the use of the protractor or degree of clearance.

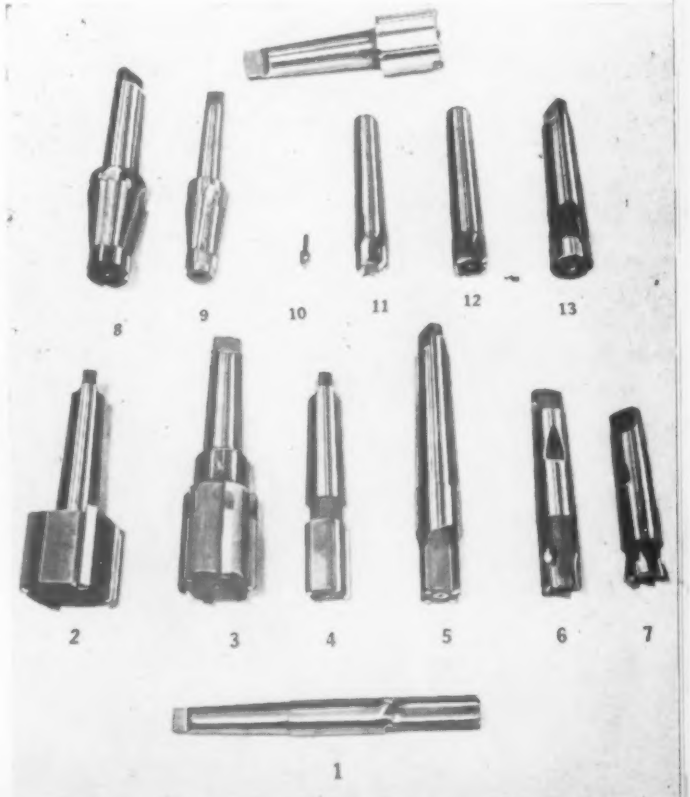


FIGURE 2.

Multi-point tools with inserted tips have increased production, saved critical material, and reduced tool cost.

Reamer shown as Number 1 produced 150 holes of 1½" diameter through 2¾" armor plate, running at 115 rpm. and .021" feed. This was accomplished with one grind.

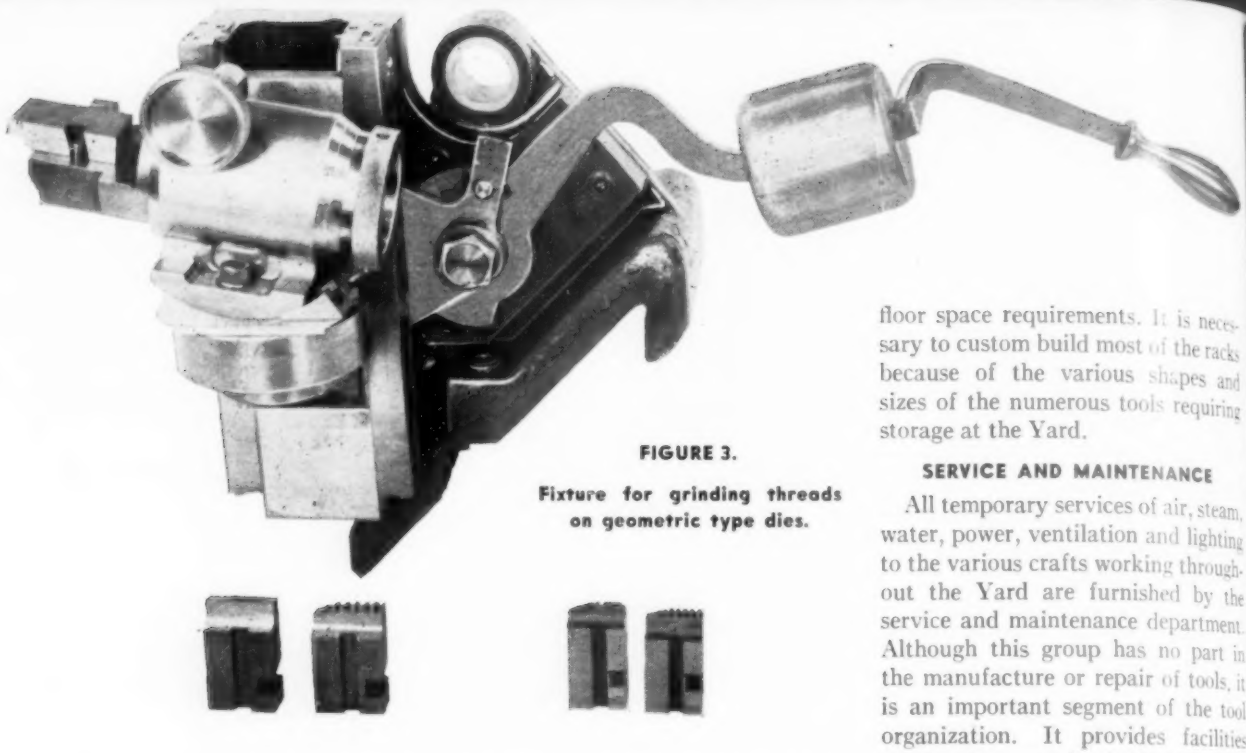


FIGURE 3.

Fixture for grinding threads on geometric type dies.

Special fixtures and attachments have been made so that even inexperienced operators may produce the most efficient grind on certain type tools (Figure 5).

STORAGE OF TOOLS

The method of storing tools in tool rooms is important and much care is exercised in protecting the cutting edges. Racks are constructed so that the cutting edges of a tool in a rack cannot come in contact with another tool (Figure 6). It is not profitable to arrive, after considerable effort, at the most efficient grind on cutting tools, and then place them in a tool bin where the cutting edges may become nicked and dull before the tool has been placed in use. As tool storage was improved at the Yard, personnel became more conscious of their value and exercised more care in handling them.

The tool racks are rotor type to facilitate accessibility and minimize floor space requirements. It is necessary to custom build most of the racks because of the various shapes and sizes of the numerous tools requiring storage at the Yard.

FIGURE 4.

Tools are shipped between central tool-grinding room and various tool rooms in containers which protect cutting edges, tapered shanks and lands.

SERVICE AND MAINTENANCE

All temporary services of air, steam, water, power, ventilation and lighting to the various crafts working throughout the Yard are furnished by the service and maintenance department. Although this group has no part in the manufacture or repair of tools, it is an important segment of the tool organization. It provides facilities ranging from ample air for pneumatic tools on ships under construction or repair to light and ventilation so that the workmen may have the best possible working conditions. Each of these factors has a direct effect upon the operation of the various tools pointing up the advantage in having control of these factors and responsibility for operation of the tools centered in one department.

Other duties of this group also affecting production are inspection and minor repair (one hour or less) of all electrical equipment in the shops, such as examining bearings and brushes. Serious damage and major overhauls due to faulty bearings can be prevented by this inspection and repair.

INVENTORY

The department in charge of inventory maintains a card index system showing the total number and location of each size and type tool in the Yard. For example, it knows where all grinding wheels are used at this plant, the number necessary for a ninety-day supply, and thus when to re-order. Duplication of requests is controlled through centralized tool control, as this group initiates the tool requisition when the inventory reaches the low limit, taking into consideration the time required for delivery.

Another advantage of having tool requests originate in one department is that different types of tools are standardized and the number of spare

● Production and profits suffer when a workman grinds only a few tools a day. Compared to his job on a machine, factors such as amount of material removed, time involved, and performance of tools he grinds are unimportant to him. In a central tool shop careful attention to such details is a major objective.

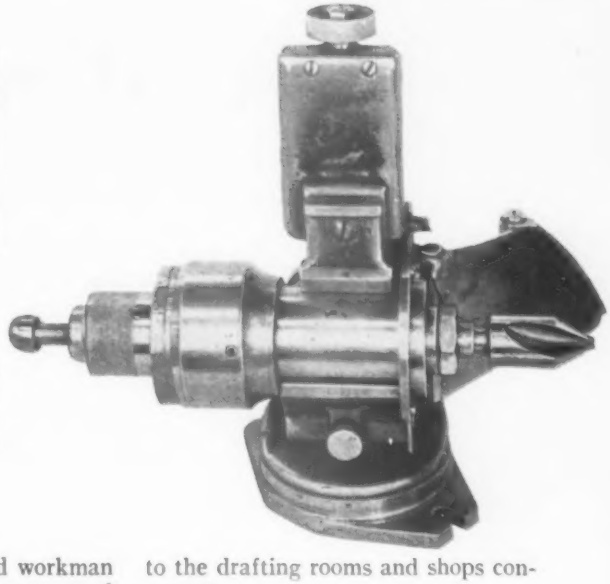


FIGURE 5.
Fixture for grinding ship countersinks has cam-operated spindle to assist unskilled operator in grinding proper relief.

parts for tools of assembled nature, such as portable power tools and torches, is held to a minimum. Data may be compiled on performance of various brands of tools, which is of value and assistance in making an intelligent recommendation on the Yard's preference.

When new tools are received, they are stamped or otherwise marked with the government stamp, listed on the Yard inventory cards, and placed in the various tool rooms where needed.

ISSUING TOOLS

As each new employe reports for work, he receives ten tool checks having the same number as his badge. Journeymen and tradesmen also receive a trade toolbox consisting of a standard set of tools common to their trade.

Workmen who are granted leave for more than one week return their tool checks and trade boxes to the tool room nearest their work, where they receive a tool room clearance slip with LEAVE stamped across the face. This slip will not clear an employe's record so that he may receive his final pay. A discharged workman turns in all government property and receives a tool room clearance slip with DISCHARGED stamped across the face. This discharge clears the workman's record.

Strict accountability is maintained by issuing all tools on checks. Steps now are under way to install the double check system. When a workman receives a tool he will also receive a square check identifying the particular tool. This will keep him informed at all times of the tools charged against his record.

MISCELLANEOUS DUTIES

All gear hobs when purchased or made are numbered and recorded in a hob book, copies of which are sent to the drafting rooms and shops concerned.

All micrometers, measuring tools and tachometers are checked for accuracy each time they are returned.

Goggles, respirators, welder hoods and other such items are sterilized after each return, placed in good condition, packed in individual cellophane bags and stored in dustproof racks ready for re-issuing. Pneumatic tools are cleaned daily, washed free of rust and scale, and either oiled or packed with grease — depending on the type of tool. Grinding wheels are purchased and delivered through this shop, and maintenance men inspect grinding machines daily, taking care of minor repairs, dressing wheels, and adjusting guards. THE END

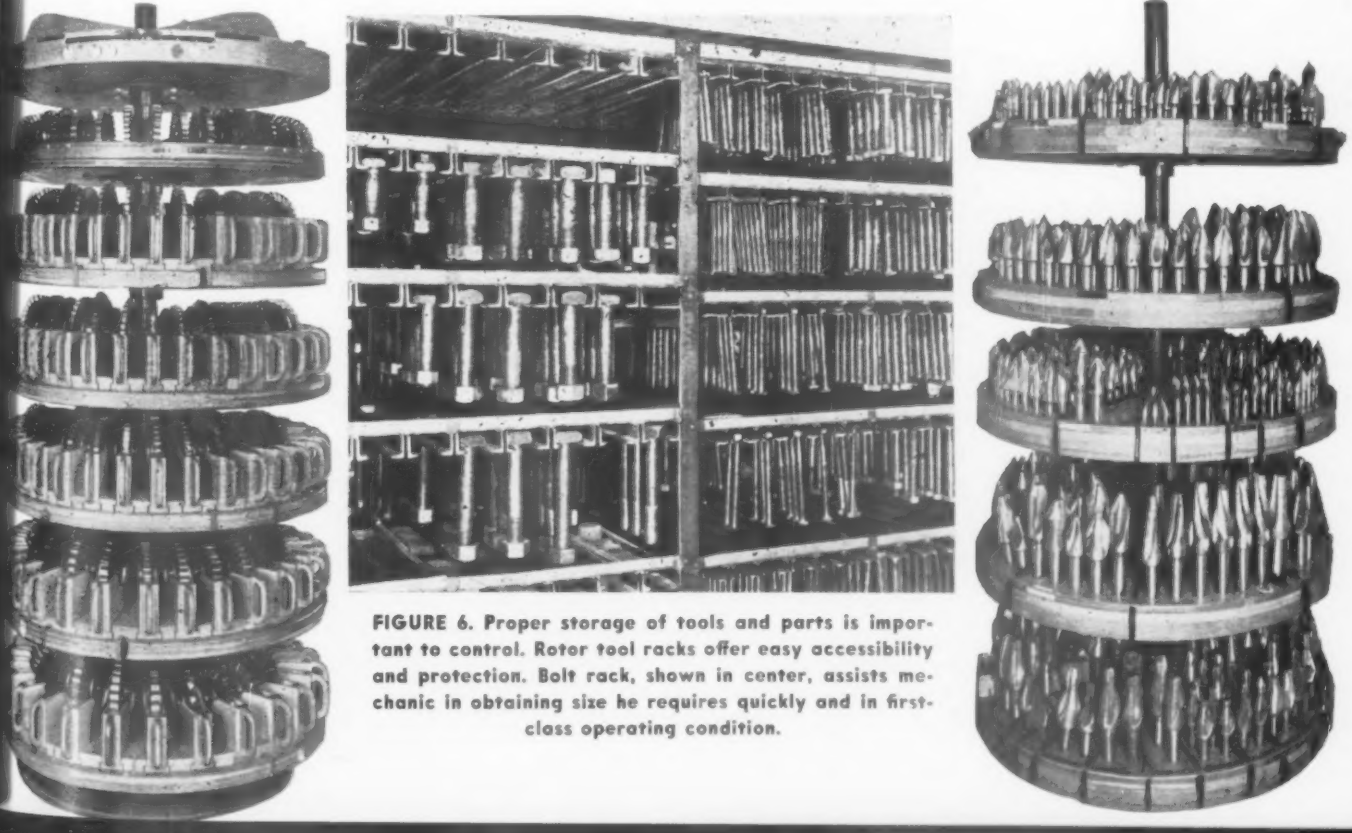


FIGURE 6. Proper storage of tools and parts is important to control. Rotor tool racks offer easy accessibility and protection. Bolt rack, shown in center, assists mechanic in obtaining size he requires quickly and in first-class operating condition.

Speeding Assembly of

Among the outstanding "know-hows" developed in Liberty Ship production are these originated at Sunnyvale, California

SETTING UP a smooth-running assembly operation in every department of the Joshua Hendy Iron Works, Sunnyvale, California, to match the production pace demanded by today's shipbuilding program has been a key to the success of this company. Reflecting the over-all picture is the job being done in the crankshaft-assembly department of this largest manufacturer of marine engines in the United States.

The Liberty ship engine, a 2,500-h.p. triple-expansion reciprocating marine steam engine, known by the U. S. Ma itime Commission as the EC-2, is a giant two-story power plant weighing 137 tons. Its crankshaft represents 16 tons of that total weight. Engines of this class never before had been mass-produced in the assembly-line manner. This has meant that every department participating in its construction has required special planning to gear its operations to the whole mass-production method.

Following the assembling of one shaft will give a clear idea of how Hendy developed a speedy and efficient technique for this complex operation.

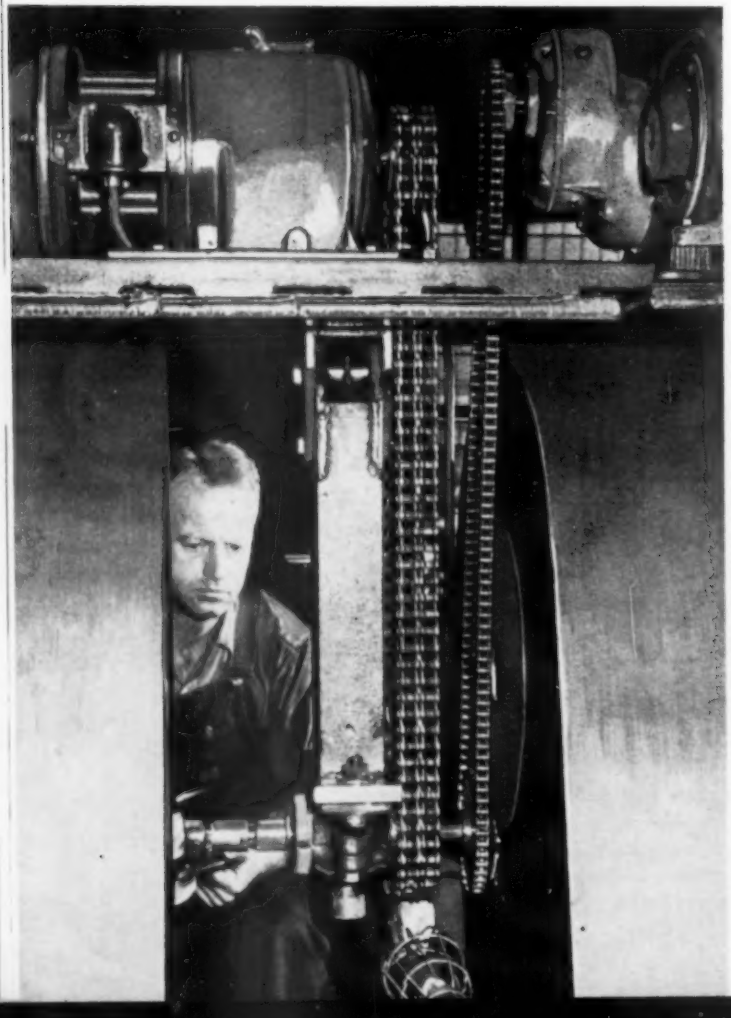
The parts used in the shafts are placed in a stock pile adjacent to the shaft-assembling department. These parts are crank pins, journal pins, thrust shafts and webs. Six webs, each weighing 1,800 pounds, are used in one shaft. These are moved to the heating tanks. Special clamping devices have been developed at Hendy for handling the webs, which are lifted and moved into the tanks in sets of two. A ten-ton overhead crane does all handling and assembly lifting and placing. The heating tanks, filled with a special heat-resistant oil, are raised to 550 degrees F., and the webs are immersed in the oil for a period of three hours.

While the webs are being heated, journal pins, crank pins and thrust shaft are placed in position on the shrinking stand and height blocks. Even the shrinking stand is Hendy-built and developed. Journal pins and thrust shaft are held by the shrinking stand in alignment, to an average of .005-inch tolerance. Allowable tolerance before finish turning is .010. The holding bases of the stand are keyed to the bed plate to assure this accuracy.

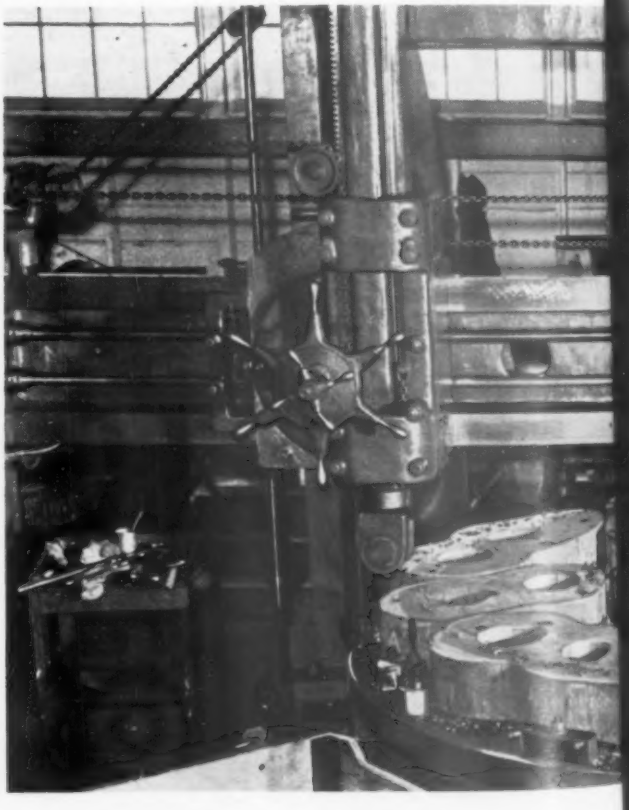
Crank pins are completely finished when brought to shrinking stands. Journal pins and thrust shaft are semi-finished to a .050 tolerance, to be finished in the lathe, following shaft assembly. One secret of successful web assembly is to have the webs in balanced relationship, despite the fact that they are not absolutely parallel.

When the heating process has been completed the well-

This portable line reamer, mounted between the crankshaft webs, is a Hendy idea. The reamer is drilling dowel holes.



Production of ship engines requires special planning.



Liberty Ship Crankshafts

coordinated crew of men who have assembled more than 400 of these shafts, move into action like a perfectly trained football team. The crane hoists a single web and carries it to the shrinking stand. The men stand by and as the web is brought opposite the first journal end, two men with a bar slide it onto the pin. A jack is placed under the end of the web, set at the approximate height which will give it the exact 120-degree angle in relationship to the other webs. The crank pin is then lifted and brought into position, and the men slide it into position.

Then the crane returns for the second web which is brought into position as before. The stands on the shrinking stand move longitudinally to permit entrance of the web. As soon as it is slid onto the crank pin, the next journal pin is slid into the other end of the web and the first pair are then in place. Height blocks are brought over and placed under the crank pin to assure exact position and the jack is removed.

The same operation is then followed with each of the two remaining sets of webs. An average of seven minutes is consumed in the assembly of each set of webs. Shrinking occurs within thirty minutes after the web is put in place. The assembled shaft is left to cool for twelve hours.

Webs are placed on the low-pressure section of the shaft in one operation and on the medium and high-pressure section in a second operation. Next, dowel holes are drilled.

An example of a Hendy principle of machine shop operation is witnessed in this next operation. Instead of moving the shaft to a power drill for the boring of the dowel holes, a special drill has been developed, a portable line reamer, which bores the dowel holes in position on the shaft. There are two inside and two outside dowels on each set of webs, and the webs are thus drilled in sets of two. Following this the webs are tapped for Allen screws.

In assembling an EC-2 shaft, eight operations are necessary for the drilling of dowel holes. This has been cut to three operations in the drilling of dowel holes for the lighter convoy-vessel engines now being built.

Next operation is the cutting of the keyways for eccentrics. A portable keyway miller, another Hendy development, is placed on the shaft as an improvement on the old method of moving the shaft to the miller.

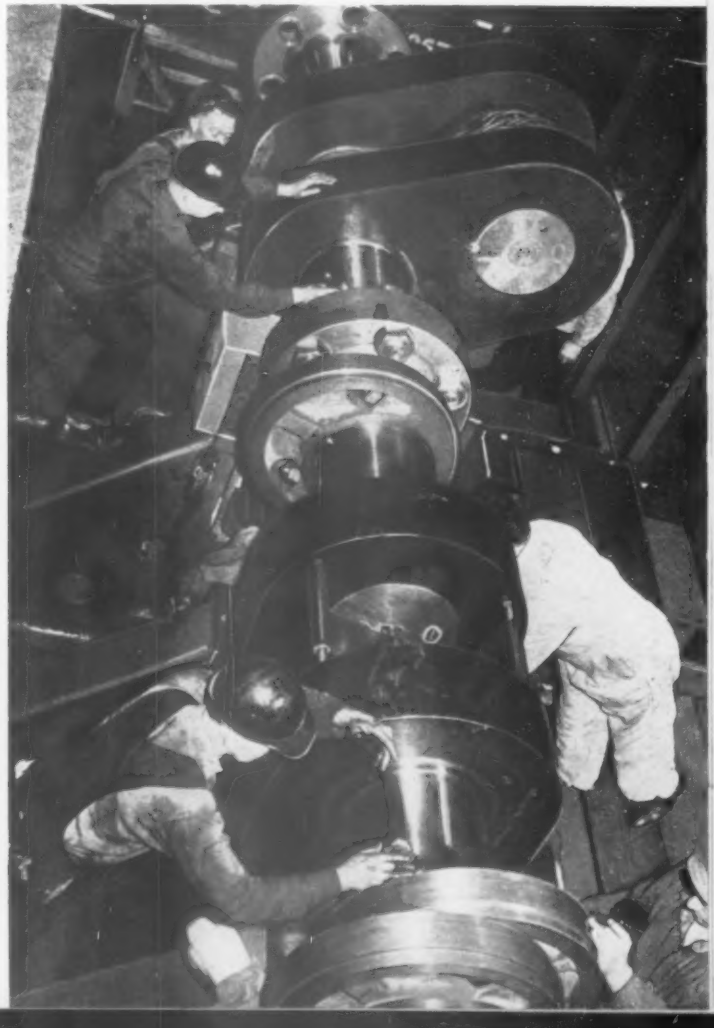
Following the cutting of the keyways, the shaft in two major parts is brought together on a stand. A portable line reamer is used to finish the flange reaming. This portable line reamer is Hendy improvement in quick assembly of shafts.

When the flanges are bolted together and the jacks installed between the webs to hold them in true alignment, the entire shaft is moved to the finishing department. Counterweights are placed in the webs and the shaft is given its finish lathe work. THE END

Eight huge crankshaft webs are faced simultaneously.

Joshua Hendy Iron Works photos

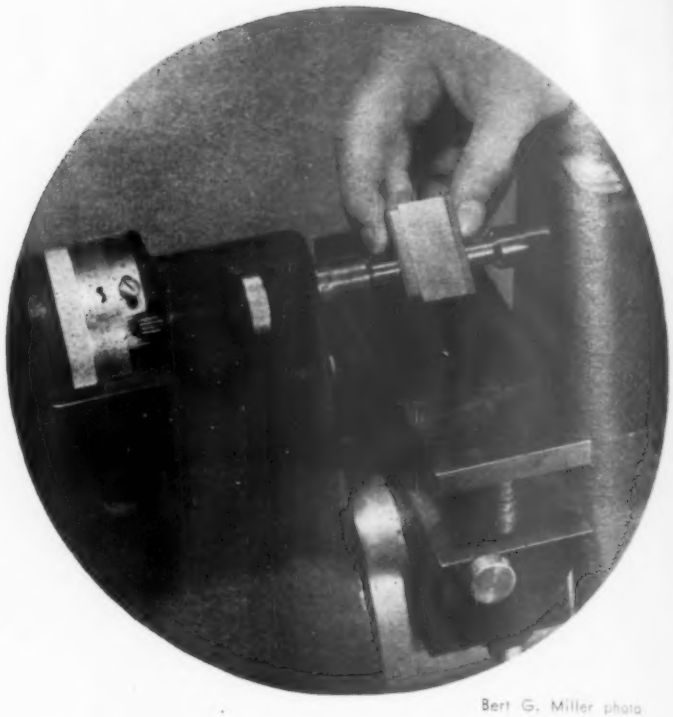
Sixteen-ton crankshaft on shrinking stand after mounting and cooling of webs in Joshua Hendy Iron Works plant.



CARBIDE GAGE BLOCKS

Accurate life of standard gage block sets is lengthened by the use of cemented carbide end-blocks in build-ups

W. A. SCOTTEN
ASSOCIATE EDITOR



Bert G. Miller photo

Carbide blocks used on the ends of build-ups act as protective anvils and reduce wear on the softer steel blocks.

IN what may prove a notable advancement in the science of maintaining fine tolerances in metal working, the use of cemented carbides has been successfully applied to master gage blocks.

Carbides have been used in working gages since 1936. The recent utilization in master gage blocks of the wear-resistant qualities of this material has extended the period of normal gage block usefulness and life beyond any point previously believed to have been achieved.

During the past few years this material has been used in plain plug, plain ring, thread plug, gagematic and numerous other types of special gages. Records of thousands of carbide working gages used on production parts show that they retain their accurate size within the allowable wear tolerance many times longer than gages of conventional materials and of the same size and wear tolerance. In some instances, it has been reported, the ratio of accurate life has reached 200 and more to one.

ACCURACY AND LONG LIFE

Today's close tolerance manufacturing techniques demand the ultimate in gage block accuracy. To lengthen the period gage blocks can be used continuously as working or master sets for comparative measurements, The Lincoln Park Tool and Gage Company, has developed cemented carbide blocks.

Known as Carblox, they are made entirely of cemented carbide. Since excessive gage block wear is found almost exclusively on those most frequently used as end blocks in build-ups, the new carbide blocks are used only as end blocks. Produced in sets of 14, four or two, they permit a sufficient number of combinations with regular blocks to fill virtually 100 per cent of the common uses for blocks. Thus, they supplement any standard set of steel or chrome plated blocks.

SATISFACTORY PERFORMANCE

In plants where carbide blocks are in use, records indicate that their useful life frequently is 50 times longer than that of many steel blocks. In most plants now using the new blocks, it is standard practice to remove the most frequently used sizes of steel blocks from the box and replace them with carbide blocks.

The makers of these new blocks are producing them to "A" accuracy (plus or minus .000004-inch), and "B" accuracy (plus or minus .000008-inch). To provide flexibility when using them as end blocks, a set of carbide blocks consists of two .050-inch, two .100-inch, one each by increments of .0001-inch from .0501 to .0509-inch, and one of .05005-inch, or a total of 14 blocks. The .050-inch and .100-inch blocks also are made in pairs of four, as well as in combinations of two .050-inch and two .100-inch blocks. Consequently, the full build-up range of the standard 81-piece set of blocks is available and supplemented when carbide end blocks are used.

Carbide blocks now are being used in setting adjustable and solid snap gages, supermicrometers, toolmaker's micrometers, measuring machines, jig borers and grinders, sine bars, amplifiers and dial gages. Numerous other applications can be found in toolrooms, inspection departments and laboratories.

SEVERAL ADVANTAGES

Carbide blocks used on each end of a build-up act as a protective anvil and reduce wear on the softer steel blocks. Advantages of the new blocks include reduction of the number of gage block checks, substantial increases in the usable accurate life of a set, as well as a reduction in the number of rejections resulting from the use of undersize blocks.

Carbide blocks have been found practically non-magnetic and highly resistant to rust or corrosion. The high cohesive factor of cemented carbide facilitates the wringing of thin blocks and eliminates difficulties encountered in wringing regular .050-inch blocks. THE END

PRODUCTION

MACHINE AND TOOL ENGINEERING

Circular broaching fixtures produce a raster with smooth finish and complete blend with rear of serrations in rotating blades. The range from milling to broaching increased production per man and machine hour. Tool shown is produced by Allis-Chalmers.

"UNUSUAL TOOLING SAVES METALS, MEN, MACHINES"

Production progress at plants of the Allis-Chalmers Company in Milwaukee is the subject of this third in a series of articles on streamlined war procurement. The wide range of manufacturing methods used by this company makes its experience broadly applicable

Unusual Tooling Saves

Streamlined PRODUCTION

JEROME S. WILFORD
ASSOCIATE EDITOR

IN its third in a series of articles on Streamlined Production, showing how American war production plants have saved man-hours, vital materials and critical machine time, THE TOOL ENGINEER highlights the achievements of the Allis-Chalmers Company of Milwaukee. This story offers a consideration of both job work and mass production. America is acclaimed for its mass manufacturing achievements—but there are still billions of dollars spent on short run production. It is important to spend those billions economically.

Usually, advantages of production streamlining are considered in connection with mass manufacturing because it is a natural assumption that production improvements are not as important to jobbing work. When balancing a run of 25 special design generators against one for 100,000 rifle receivers, it is obvious that tooling improvements, materials savings, or reduction in man-hour expenditures will show a greater saving on the longer run.

But, in a year's job work—the special generators plus hundreds of other short run items—the total gain from streamlining methods can be considerable.

•

THE biggest handicap facing the production engineer in a job shop is that big tooling developments cannot be amortized over long periods. Special purpose equipment must be relatively inexpensive.

The highly ramified activities in the Allis-Chalmers plants afford an opportunity to study ingenious tooling on both types of production. Production engineers in these plants have streamlined operations on short and long runs. And while they talk of the latest improvements, they can generally speak of a method on the board which will "go it one better."

Allis-Chalmers is building a tremendous variety of war products—not only in expanding its regular line, but in building new items. But it has always been accustomed to rapid assimilation of the requirements of new jobs, because a major share of its operation has always been conducted on a job work basis.

By eliminating a percentage of man-hours, materials, and machine time, or by showing more output per production hour or per pound of material, Allis-Chalmers is cutting manufacturing corners.

Certain highlights of the streamlining effected in these plants, indicate that it was usually mass production improvements which were made over old methods actually used at one time in the plant. Improvements on job work were made on the methods of another manufacturer, or over something the production engineer thought of doing but did not do. Economical job work generally will not permit major changes, and thus, most of the time, the "old" method is never used. The job begins with the improvement.

★

MULTIPLE BORING BARS ON WINCH CASE

PRODUCTION on a ship's winch case has been improved at a ratio of 5 to 1 in boring, simultaneously facing and counterboring holes with diameters ranging from 5-½″ to 12-¼″. This was accomplished with the application of a multiple boring fixture which is provided with five boring bars.

Originally, the operation was done on a 6″ floor-type boring head, with a journeyman and helper on the job. Time required for complete boring and facing was 95 hours. Under the present method, with five men operating the machine, time is cut to 18.5 hours per base.

The new fixture is 16′-1″ long, with 10′ boring bars supported across its width. Bars are 4″ in diameter, employing cutters for diameters up to 7⅛″ and boring heads for larger size holes. Bars are supported by bearings at each end, and by a center bearing support beam spanning the length of the fixture. Bearings are floating type throughout, except at the driven end of the bars, where worm-driven and keyed bearings are used.

Five bars bore 12 holes simultaneously, then counterbore and face three holes. On boring, two roughing tools are used, followed by a single edge finishing tool. From ⅜″ to ½″ of stock may be removed on the periphery of the cast holes.

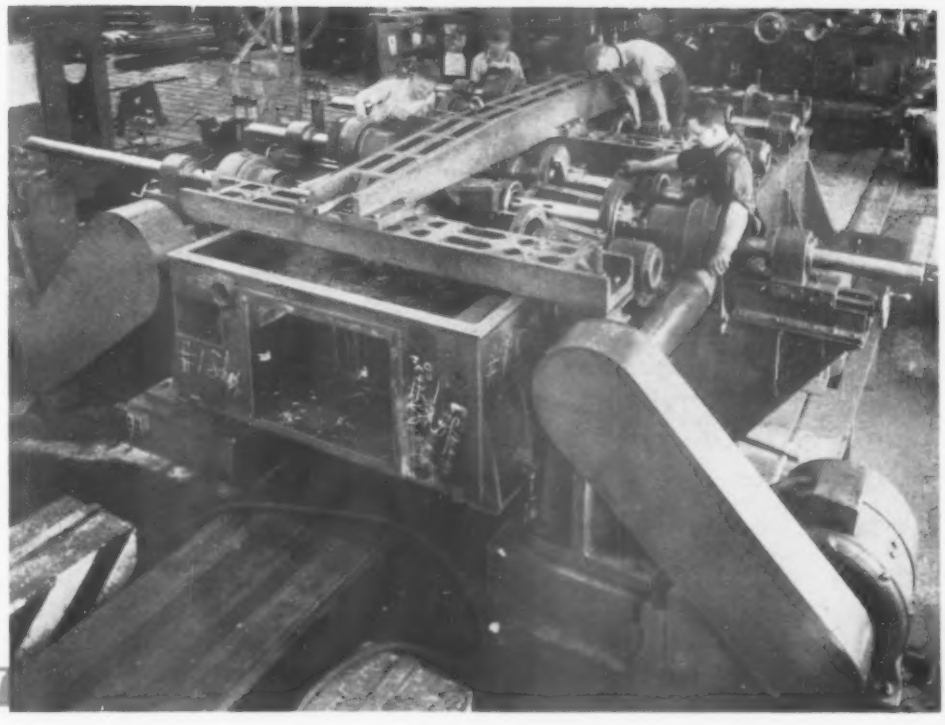
Four bars operating together are driven by a single motor. Individual bar feeds are regulated by a star wheel which is tripped by a pin on the driving bearing. Feed

of the boring bars is at the rate of .020" per minute.

Winch cases are built up from boiler plate, with high-carbon steel bearings. Boring must be done on both right and left hand bases as well as on covers. Covers have semi-circular openings on each side which fit over the projecting bearing housing on the case. Because location of centers is identical with that of the base, these covers can be half-bored and faced on the same fixture used for the base.

Right and left hand bases are bored on the same fixture by doing one in an upright position, and the other in an upside down position. This switch requires certain adjustments in the fixture because the holes are not in the center of the base sides. These adjustments consist of removing 6" spacers from beneath the side bearing support beams and turning over the center bearing support beam and suspending it from the end beams on the fixture instead of resting it on top.

Overall production time for facing and counterboring holes on winch case was cut from 95 to 18.5 hours by use of multiple boring fixture. Five bars operate simultaneously, four being powered by a single drive at one side.



Separate drive powers the fifth bar in multiple boring fixture. Individual bar feeds are regulated by a star wheel, tripped by a pin on the driving bearing. Note spacer blocks which make fixture adjustable for machining right and left hand cases.

DRILL JIG INCREASES PRODUCTION

INCREASED PRODUCTION even with less skilled workmanship has resulted from application of drill jigs and respecification of locating points in the manufacture of spacing discs for a speed changer.

This part consists of a saucer-shaped disc and shaft—or hub—cast in one part. Adjacent to, and concentric with the hub are three kidney shaped core holes, spaced by drilled holes. The hub is provided with both internal and external keyways. Assembly of several discs in the speed changer permits leeway in alignment of core holes, but drilled holes must be in close alignment. Keyways must also be in close relation to each other and to the drilled holes.

In previous machining operations, holes were drilled in relation to core holes and keyways were broached or milled in relation to drilled holes, with the usual result of accumulated error that transmitted itself back to the alignment of the drilled holes in assembly. When these holes failed to line up, careless assemblers occasionally attempted to produce alignment by re-drilling the entire assembly. This naturally resulted in creating an oval hole in the faulty disc, or sometimes oval holes in all but the faulty disc. Even with a properly adjusted assembly, time is lost in dissembling to locate the error.

Under the new production method, coincidental with broaching both keyways, the internal keyway is located from an indicated core hole. Following this operation, all further machining is located with respect to the internal keyway. All machined surfaces are in close relation to each other, and all are within the allowed leeway with respect to core holes, as encountered in locating the first operation.

A simple drill jig, in which the keyed disc fits over a splined shaft, assures close alignment of drilled holes. The jig is so light in weight that a woman can carry it easily from the crib to the drill press.

A change in casting design will specify enlargement of one core hole to permit tool clearance for broaching a 5/16" external keyway which has been milled.

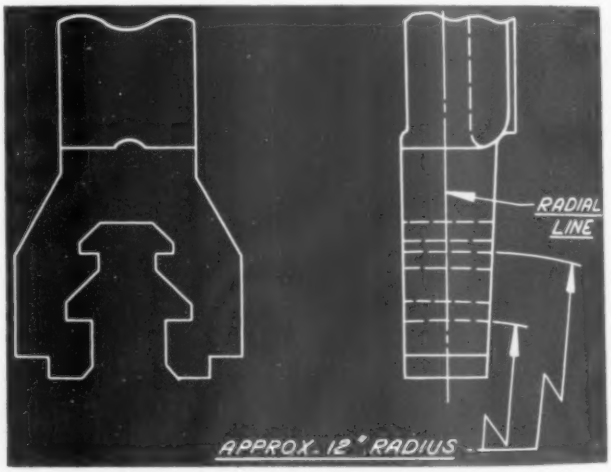
Increased interchangeability has permitted division of labor on assembly, with a considerable production advantage. And, of course, interchangeability has decreased scrap, lowered demand for skilled assembly labor and reduced the hazards of using unskilled assemblers.

On the average, the method saves 1-½ to two hours per assembly, and assures greater production through faster supply of parts.

Spacing discs must be accurately machined for alignment of drilled holes in assembly.

BROACHING ON A RADIUS

THE ROOT ENDS of turbine blades are serrated to lock into the grooved periphery of the turbine spindle. For full bearing, these serrations have a radial surface which formerly was milled, and in most shops still is being milled. However, one of the blading shops at Allis-Chalmers has been equipped with two "circular" broaching fixtures. Radii ranging between 7-11/64" and 15.8" are produced by curved broaching tools. The tools are clamped to a head revolving in a vertical plane. Cutting may be done on both internal and external peripheries.

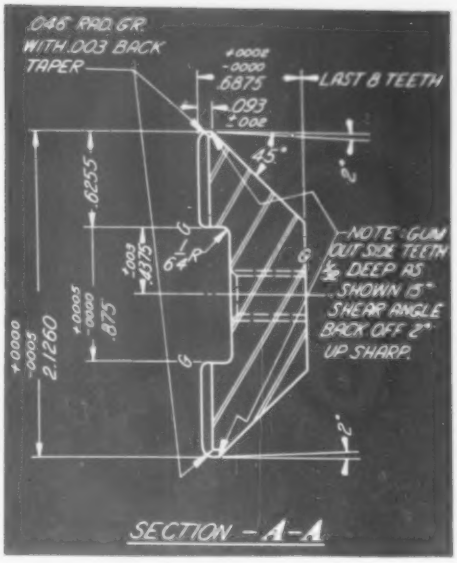


The objectives of this machining operation are to produce a radius, a smooth finish, and a complete blend at the root of the serration. A tolerance of .001" is considered sufficient to obtain this blend across the face of the surface. However, the relation between the serrations and the base of the blade is held within .005". The actual radius is held to only .015", which is considered sufficient in view of the relation between the radius and the relatively short length of machined surface. Depth of cut

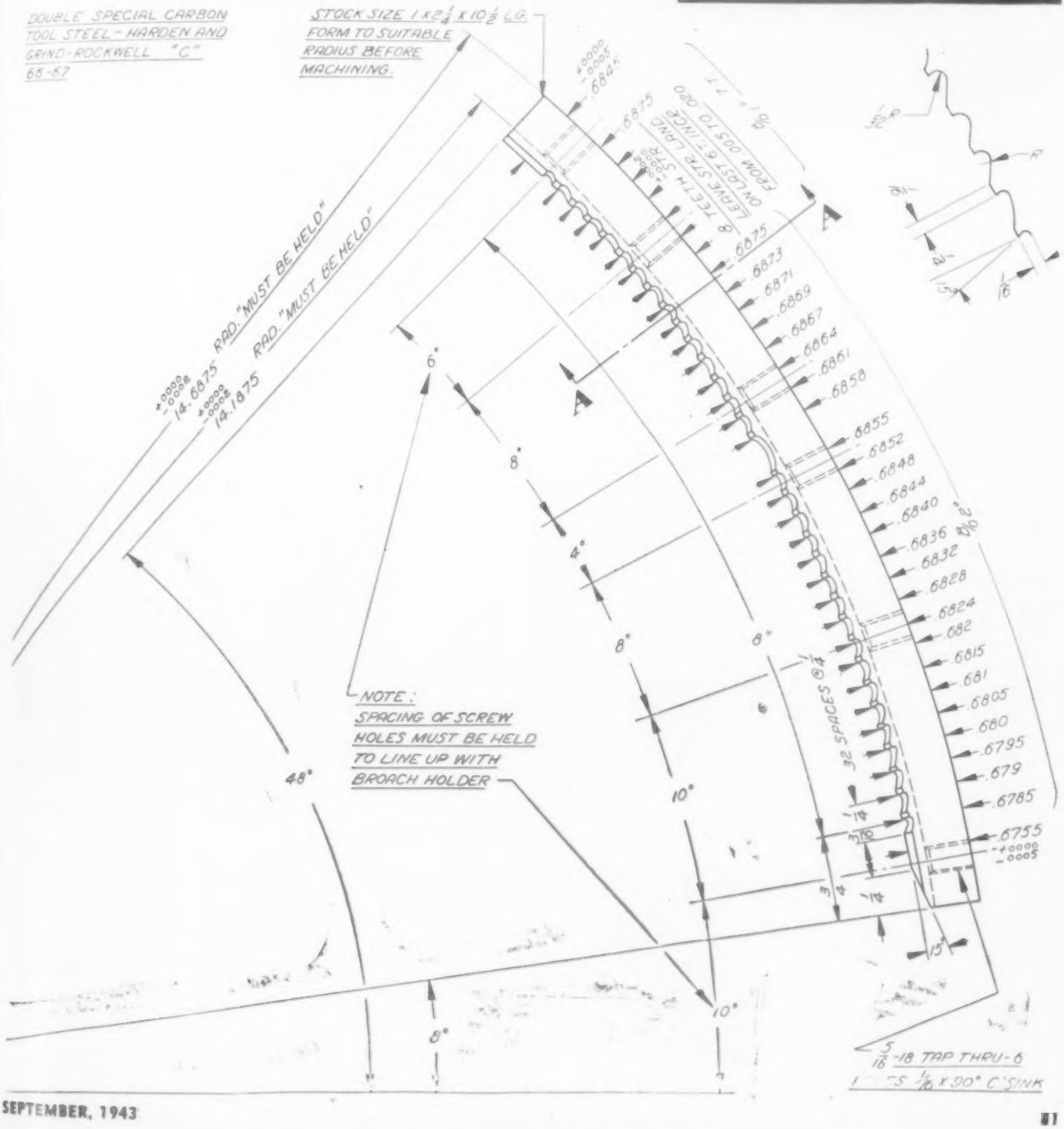
varies between .002" and .006" at the crown of the finished surface.

Fixtures, with an overall height of 64", are equipped with a 33" head and a 22" head. Grooves on the face of the head take holding fixtures for tools of various radial development. The work is clamped hydraulically in special jigs designed for each blade style. Spindle drive varies between 1.65 and 5.32 rpm.

Tools are produced complete by Allis-Chalmers. Teeth are conventionally produced in a flat bar of high speed steel, the bar is then curved, and the cutting edges are finish ground in a special jig permitting accurate presentation of each tooth to the grinding wheel.


.046 RAD. GR. WITH .003 BACK TAPER
LAST 8 TEETH
NOTE: GUM OUT SIDE TEETH ½ DEEP AS SHOWN IS SHEAR ANGLE BACK OFF 2° UP SHARP.
SECTION – A–A

At right, cross section of curved broach. Below, tool drawing shows steps in broach teeth.


DOUBLE SPECIAL CARBON TOOL STEEL - HARDEN AND GRIND - ROCKWELL "C" 65-67
STOCK SIZE 1 X 2 1/4 X 10 1/2 LG. FORM TO SUITABLE RADIUS BEFORE MACHINING.
14.6875 RAD. "MUST BE HELD"
14.1875 RAD. "MUST BE HELD"
NOTE: SPACING OF SCREW HOLES MUST BE HELD TO LINE UP WITH BROACH HOLDER
32 SPACES @ 1/4
5/16-18 TAP THRU-6
.675 X 90° C'SINK

FABRICATION AFFORDS PRODUCTION ADVANTAGE

BRUSH HOLDERS for a variety of generators have been re-designed to afford faster production with fewer man-hours, less use of critical material and an improved product. Formerly cast in bronze, they are now fabricated from stretcher level steel with savings in a critical material, lower product rejection and lower tool depreciation.

Though overall sizes are the same for this particular model of brush holder, slots to hold the carbon brushes are produced in six sizes, ranging from ½" by ¼" to 1⅛" by 1-¼". For the cast-bronze type, these slots were finished by broaching, requiring maintenance of six tools, and resulting because of certain peculiarities of the job in a fairly high tool breakage cost.

In addition to the regular scrap involved in machining, a further loss was encountered in almost unavoidably careless handling of the finished casting. Tossed from the machine or assembly tables into bins, or dropped on the floor, the castings were frequently cracked. The steel fabrication has passed shock tests which castings failed to pass.

Three tons of bronze per month, vital machining time, and thousands of man-hours have been saved in fabricating this stronger, lighter product. The entire part is produced from two steel stampings, projection-welded together.

Brass inserts are brazed to the body at each end of the slot by induction heating. Variation in size of the inserts provides the entire specified range of models.

Blanking and piercing, previous to bending to shape, have relieved such machining operations as notching, boring, drilling, reaming, broaching and tapping. Where a bolt was threaded through the casting to provide a means for assembly on the generator, it is now passed through a pierced hole and welded to the brush holder body.

In addition to relieving machine tools by using non-critical punch presses, a production advantage in man-hours of 3-to-1 has been scored over the combined casting and machining method formerly used.

FLEXIBLE DRILL JIG

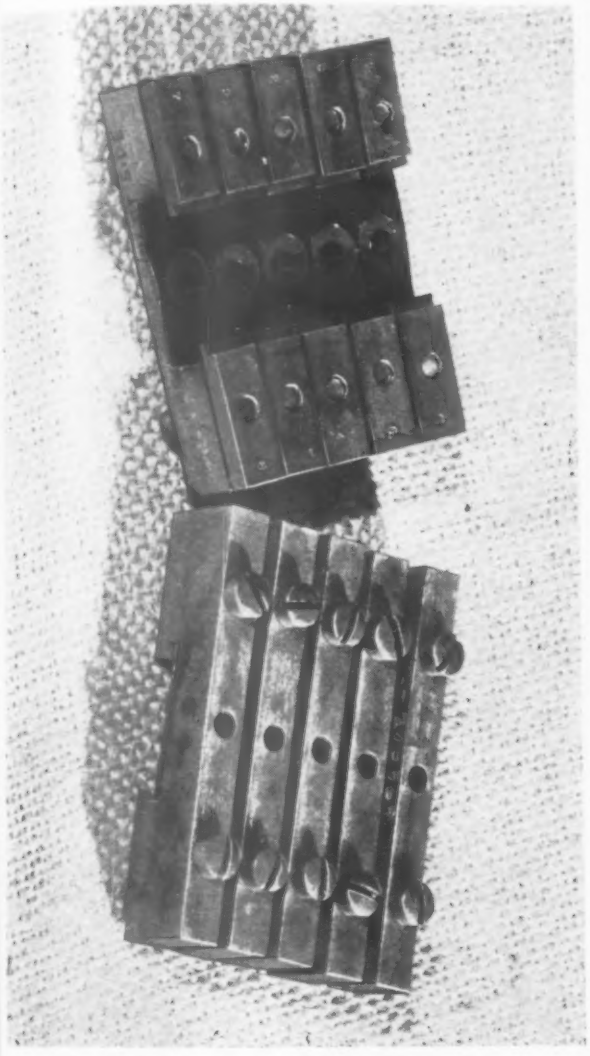
Streamlined PRODUCTION

ABOVE the fan of impulse blades on the spindle of a turbine rotor, a curved channel or shroud is fitted in sections. Drilled or punched holes fit over round or irregular shaped tenons projecting from the end of each blade.

Slight irregularities in spacing of blades do not permit use of the common type drill jig. Channel sections must be fitted to specific groups of blades. The first method used—scribing templates for each channel section to indicate exact hole location—created more than one difficulty. First, scribing in this instance was an awkward procedure. Second, the channel is drilled or punched as a flat piece and then curved in conformity with the periphery of the turbine spindle. Development of the curve imposed a difficult problem of transposition in marking the hole locations.

A flexible drill jig solved the problem. This jig consists of a series of hard steel bars, each with a hole of correct diameter or shape in the center. The bars are held by set screws to a piece of spring steel, slotted for adjustment of the set screws and to permit clearance for drilling. The flexible jig is fitted over the tenons on a group of impulse blades. Each bar is capable of free movement to assure a comfortable fit, movement being on the periphery of the spindle as well as from side to side to compensate for minor misalignment.

The flexible metal makes it possible to adjust the bars accurately in a curved position, after which the set screws are tightened down and the jig is removed. When the jig springs back to flat position, the relation of the holes is maintained for curving the channel section after drilling. The jig is clamped in a rigid fixture and the channel can be accurately drilled or punched.



MATERIAL SAVINGS

ON an order for several hundred generators, Allis-Chalmers production engineers saved more than $14,000 worth of sheet steel by utilizing scrap, with minor savings resulting incidentally to the major cost reduction.

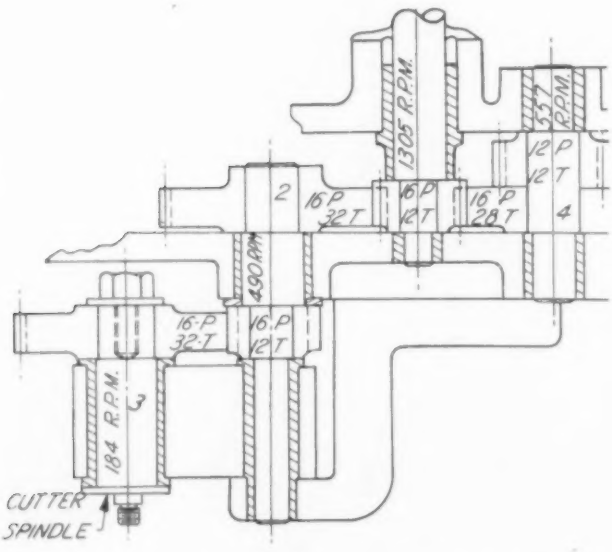
Armature laminations required 33,173 sets of sheet steel .014" by 30" by 120", and 28,000 pieces measuring .014" by 16" by 25½". By utilizing previously scrapped center punchings resulting from production of laminations for a 25" armature, this requirement for new stock could be cancelled. Though this scrap was .018" thick, it proved suitable for the purpose, and provided an incidental benefit in that fewer of the thicker sheets had to be handled or stacked per armature. A further saving resulted because it was not necessary to shear or slit the scrap sheets before punching.

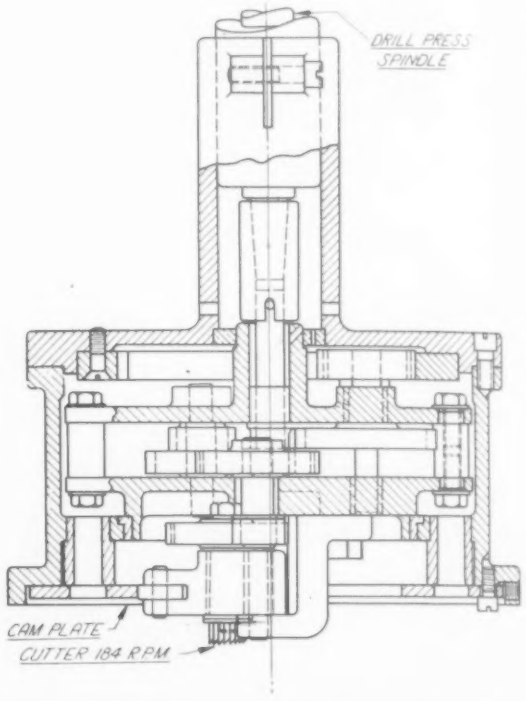
PLANETARY HEAD FOR DRILL PRESS

CERTAIN TENONS on the ends of turbine blades are finished to an irregular contour. Previously, this was done on a Gorton milling machine, utilizing a follower on a template or cam, and requiring the attention of a semi-skilled workman.

A head with a planetary gear train, enabling the head and cutter to turn about a cam contained within itself, has been designed for attachment to a standard drill press. The result is an immediate release of a critical machine and skilled operator, and faster production. Construction of several heads will permit production on several pieces with one operator loading and unloading.

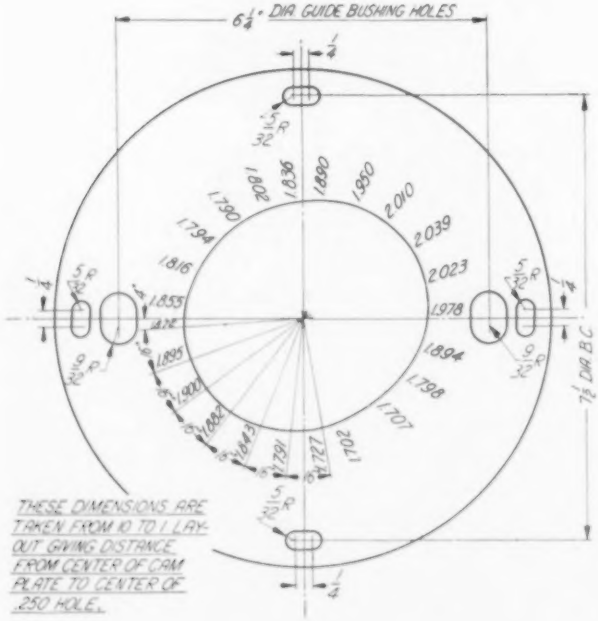
Equipping a small bench drill press with this planetary head and using a four-position index fixture operated by air will convert the drill press into an inexpensive automatic machine. This speeds production and requires only continuous loading. The clamping and ejection of the workpiece into a container can be performed by pneumatic devices.

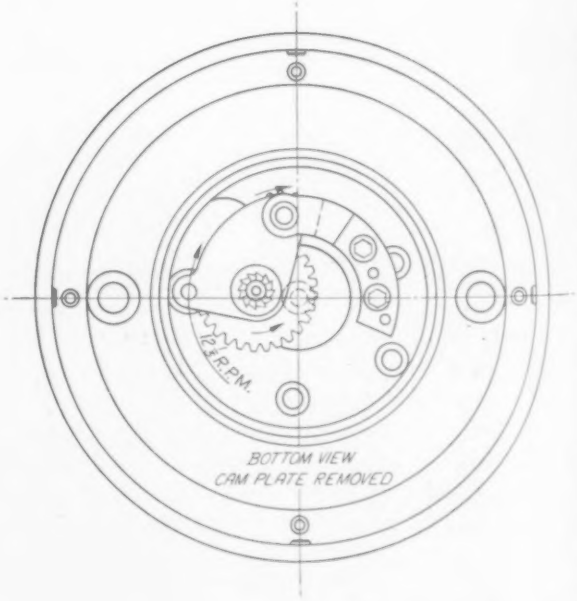




Above, schematic layout showing section of planetary gear train. Below, cam plate is shown.

Above, complete drawing shows planetary head. Below, bottom view of head with cam plate removed.


6 1/4" DIA. GUIDE BUSHING HOLES
7 1/2 DIA. B.C.
THESE DIMENSIONS ARE TAKEN FROM 10 TO 1 LAY-OUT GIVING DISTANCE FROM CENTER OF CAM PLATE TO CENTER OF .250 HOLE.



SMALL TURBO COIL WINDING MACHINE

Streamlined PRODUCTION

PRODUCTION WINDING 3/32" hard rolled copper strip, as wide as one inch, for turbo-generator coils is an achievement in electrical manufacturing. In the first place, the stock is coiled flat, i. e., one on the other—to fit a rectangular core. This means that 90° corners are produced by developing radii at regular intervals across the one-inch width. These corners must be without warp or wrinkle, so that the finished coil is flat and true. Secondly, one side of the coil is progressively stepped in.

Formerly, these coils were wound on machines which required two men for operation. C-clamps were used to hold the copper strip in place as each corner was formed, and then, following bending, the copper generally bowed and had to be flattened or bumped and the sides straightened.

One man can operate the new machine which takes copper off a reel by a winding head on a vertical spindle. Quick-acting air-operated clamps hold the strip on the turns as well as from one finished turn through the completion of the next so as to maintain straight side sections. As each turn is completed, a previously finished portion is released to fall by gravity on the fixture base, where the turns stack one upon the other.

The copper is wound, and turns or corners are produced, by means of a die inserted in a hand pulled lever. The copper is automatically ironed and shaved down from the neutral axis point to the radii on the corners.

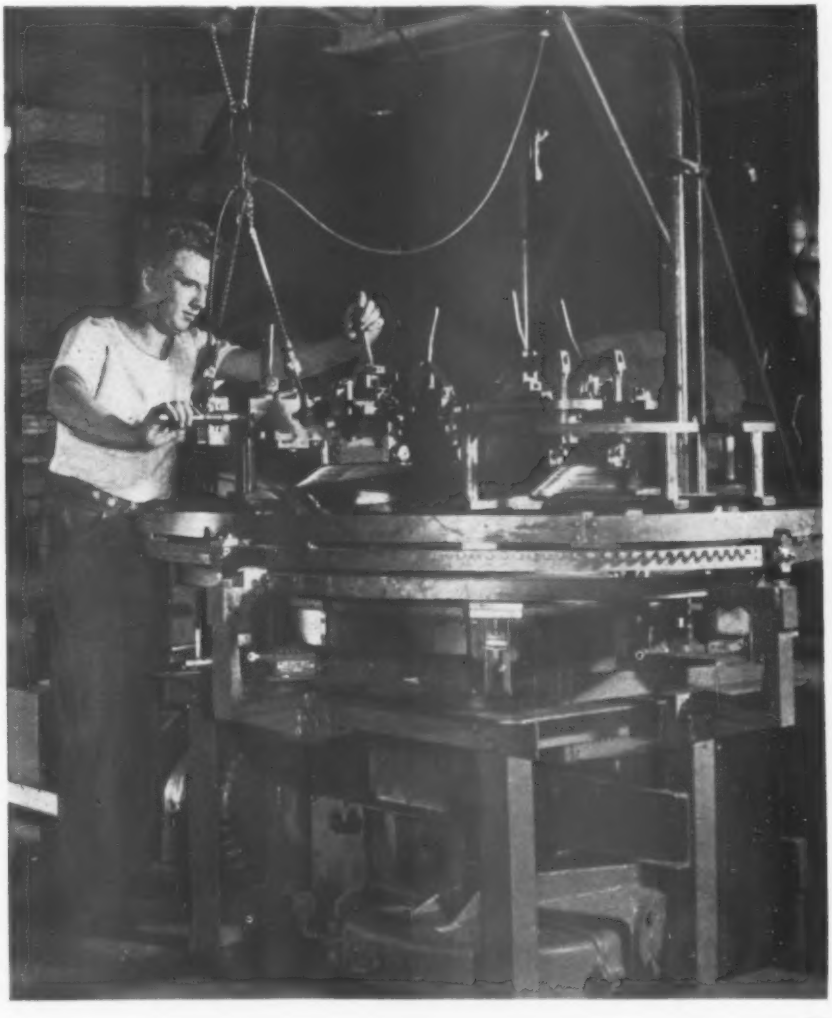
Each turn of the coil is stepped in by means of an index ratchet and ratchet pinion, thereby giving the exact form necessary to fit into the slots of the turbo rotors. The step-in per turn is automatic. Two machines, one turning clockwise, the other counter-clockwise, can be operated together so as to produce both left and right hand coils. Fed from separate reels, the copper must be received on opposite sides of the machines and the steps must be produced on opposite sides.

These machines can be adjusted to take in coils of various widths and lengths, and to produce different inward steps of the conductors. The stepping variations depend upon the pattern or ratchet pins set up on the circular rail upon which the indexing ratchet travels.

When a complete coil is finished, it is not necessary to bump or straighten corners or sides. Radii are produced to engineering dimensions. THE END

Below:
Coil, completely wound, is ready for assembly. Winding machine has finished turns without warping or wrinkling flat strips.

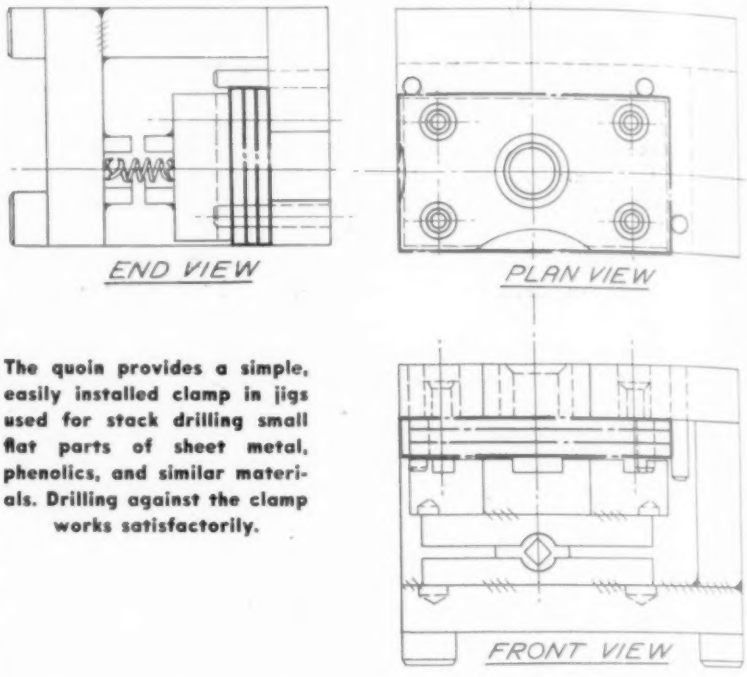
Right:
Coil winding machine produces accurate radii and progressively steps in successive turns on one side of the coil.



Low-Cost Clamp for Small Fixtures

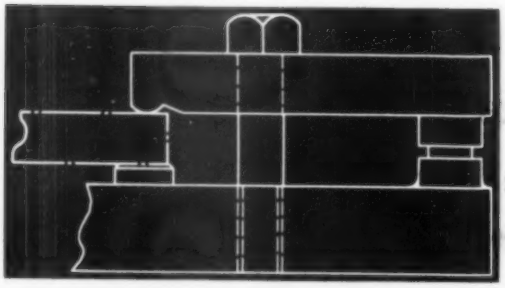
● An expanding device, known to printers as a quoin and used in locking type in a form, has been applied with success to clamping small parts for a variety of machining operations. The quoin is a milled steel, hardened, three disc cam. Positive locking and quick acting, it affords a means of speeding small lot production.

Self explanatory sketches on this page show the quoin tack-welded to the tool. It is necessary to disassemble the quoin prior to welding, to prevent injury to the cam and springs.

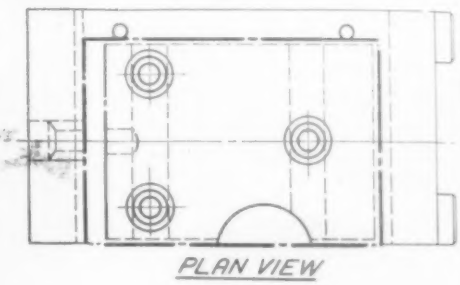


The quoin provides a simple, easily installed clamp in jigs used for stack drilling small flat parts of sheet metal, phenolics, and similar materials. Drilling against the clamp works satisfactorily.

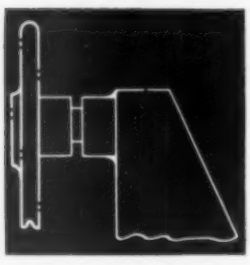
Used to actuate strap clamps, the quoin acts much faster than screw action clamps. This use is helpful on milling fixtures and boring fixtures, and for light machining operations on aluminum or magnesium alloy parts.

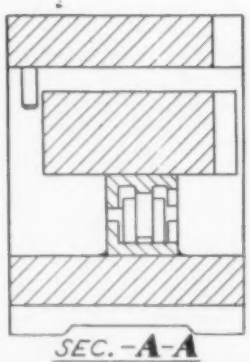


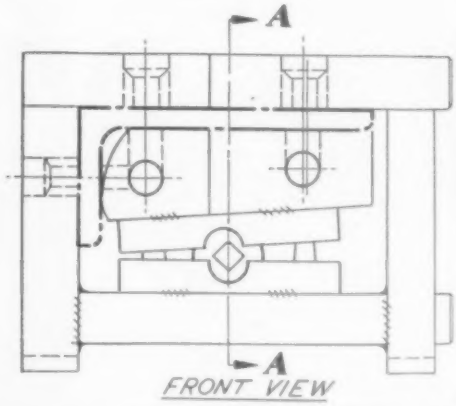
Combined locating and clamping action is provided by the quoin's adaptability to non-parallel surfaces. This application is useful in drilling extruded angle sections. Quoin should be placed so that drilling pressure will tighten the cam.



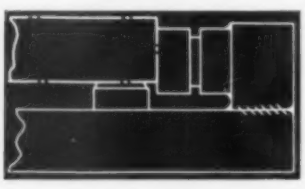
Quoin works well as a jack support.



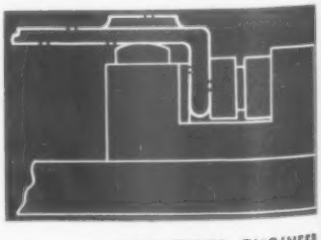




The quoin makes a handy side clamp, particularly when clamp height must be limited, as illustrated below.



This drawing shows the quoin used as a web clamp. This application simplifies design and operation of many fixtures used for holding fragile castings and pressed parts used in war production.



Screw Machine Progress

What modernization features can you expect from re-design and re-building?

How is synchronization for varied set-ups maintained? What are the benefits of double-action tools? How do they operate? Read the answers in this second in a series of articles on screw machines

JOHN E. HYLER

SCREW MACHINE designs, tools and attachments are subjects of wide and growing interest. Their development has been steadily progressive, both here and abroad. One English machine, for instance, that is referred to as a two-operation model, has been designed for use on parts which require only end-forming and cutting-off operations. It has a capacity of ¾″ diameter and 9″ length, and will produce from 200 to 300 pieces an hour.

Another line of screw machines made in England includes both standard and special models. The specials have been designed to reduce the idle time ordinarily consumed by feeding of the stock and indexing the turret, turret travel being restricted to a shorter span than ordinary. Both of these are single spindle machines.

However, the advances made in this country alone easily afford sufficient subject matter for this series of articles.

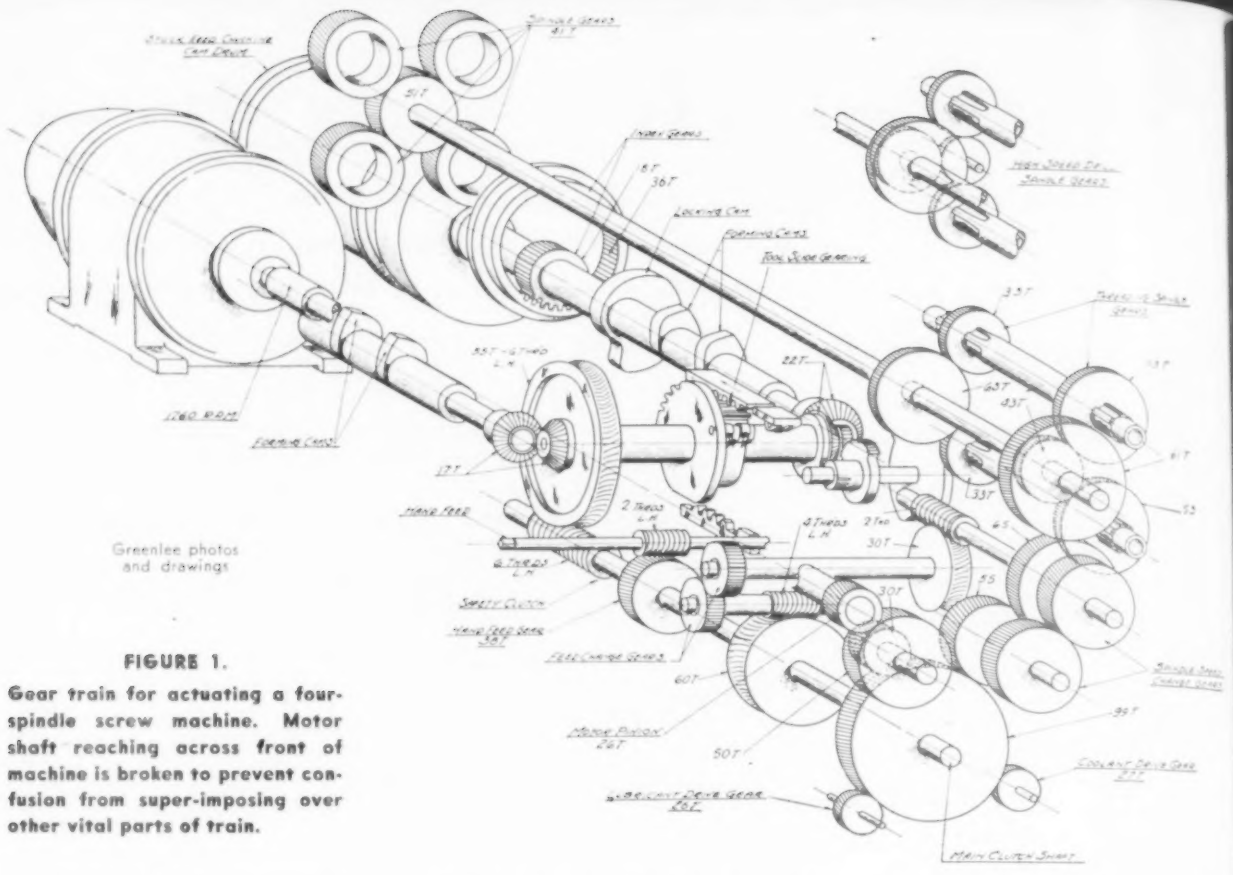
Available hand screw machines of competent type, in which the tools are advanced to the work by hand actuation, are helpful when the use of an automatic is not justified. Even in automatic screw machine departments they can take over short runs and second operation work, and thus permit the expensive automatics to be concentrated on long-run jobs.

One line of hand screw machines has a lever-operated cross-slide, carrying a tool post mounting at each end, and, at the right-hand end of the machine, a lever-operated turret, which is capable of being indexed. The cross-slide is adaptable for 1-¾″ and 2-¼″ diameter circular form tools, and the turret is designed to receive standard B & S turret tools or their equivalent.

A hand screw machine is fitted with a variable speed device for the spindle, is an exceedingly convenient arrangement, because it permits an operator to select at once just the speed needed, depending on the type and the size of stock being machined. A turret type hand screw machine thus fitted provides for the adjustment of spindle speed through a handwheel located within easy reach of the operator. The machine is designed for what amounts to rapid production on hand screw machines. Exceptionally rigid, the head is cast solid with the bed, and the spindle is carried in tapered roller bearings, all bearings for the sliding members being accurately scraped. It carries a hexagon turret, which is provided with six tool holes. It is arranged to hold tools with or without shanks, since bolt holes are provided for fastening tools to the faces of the turret.

A special hopper-fed drilling and forming machine is closely allied in design to the automatic screw machine. Several types of feed are available, and it may be had in three different sizes, for handling workpieces from the smallest up to ⅝″ diameter to 5″ long. It will feed headed screw blanks, special rivets, studs, or any straight blanks without heads. Also, it handles small tubes or shells, with or without closed ends. The working spindle is of two-jaw type, and the workpieces are fed either head or point first into the spindle, so that pointing, shaving, drilling or hollow milling operations may be performed. The tool holder is rocked on the tool shaft to carry it into the cut. It is claimed that 20 different operations can be performed on this machine.

The modern screw machine has advanced to the point where no job should be considered impossible before, and unless, an expert has been consulted.



Greenlee photos and drawings

FIGURE 1.

Gear train for actuating a four-spindle screw machine. Motor shaft reaching across front of machine is broken to prevent confusion from super-imposing over other vital parts of train.

POSSIBILITIES IN RE-DESIGN

Many out-of-the-ordinary results are obtainable in redesigning standard automatic machines. The close relationship of the automatic screw machine to the automatic chucking machine bears on this point. In one instance, a standard four-spindle automatic screw machine with a 7/8" capacity was converted into an automatic chucking machine by its maker. This was done by equipping it with a freely revolving head for automatically loading the chuck without stopping the spindles, and by installing a hand chucking slide together with the necessary chucks and centering bars. The machine chucks work with a face diameter of 2-1/4", and holds the work within a tolerance of .003".

The opposite aspect, or that of converting an automatic chucking machine into a screw machine, has been done by a leading manufacturer. A high-class single-spindle automatic chucking machine was slightly redesigned to convert it into a bar machine that would handle stock up to 5" in diameter. The same basic machine was thereby made available for chucking or screw machine work.

FIGURE 2. Spindle drive shaft on a six-spindle machine, in transmitting power from gear box at right, passes directly through the main tool slide.

One highly-interesting instance of re-design and re-building incorporated the use of a double friction clutch of standard make. Cam-actuated, the clutch operated spiral gears in either of the two directions in which it was thrown. By so doing, it advanced two small milling cutters in different phases of the operation. The screw machine was one of 7/8" capacity, single-spindle type.

There are, of course, a number of firms specializing in the re-building of machinery in general, who are in a position to re-build automatic screw machines. Some of these are exceptionally thorough in their work, tearing each machine down to the bare frame, re-scraping and re-aligning all sliding surfaces, and replacing all worn or defective parts. For re-building and thorough modernization, there are also specialists, such as the Modern Collet & Machine Company.

A firm of this type has facilities for producing and applying many modern screw machine parts. Spindles are fitted with ultra-precision taper roller bearings. Dovetail cross-slides with hardened and ground gibs and blocks are furnished. Cross-slide drums equipped with roller and ball thrust bearings are built in. Chrome vanadium steel helical gears are used on all spindles. All main tool slides are fitted with hardened and ground

bearings. New type clutches are installed, and central gravity oil feeding systems are used.

OTHER MODERNIZATION FEATURES

One of the more modern features that is sometimes applied to an automatic screw machine is electrical control. A special control panel has been developed for a certain screw machine by an electrical parts manufacturer and doubtless such controls could be designed for others. In this particular case, a four-speed motor is used to operate the spindle. The machine is geared so that eight operating speeds are provided for the spindle, as well as a reversing speed. There is a four-speed starter, consisting of eight magnetic switches and a pair of thermal ove.load relays. The starter is controlled by a pilot control contactor, operated by six levers, in a small box at the end of the machine. The levers are actuated by dogs which are set according to the speed of operation desi.ed.

In many cases, the application of a modern drive to a screw machine is extremely helpful, and it saves much space. Some of these drives are so arranged that the driving motor for the spindle is held directly above it, supported by a husky bracket securely bolted to the frame of the machine. These drives have all the facilities needed for highly efficient operation. Such installations may be made, of course, only where the machine itself has a sufficiently heavy frame to bear the weight of the drive.

In the case of lighter machines of single-spindle type, and particularly Brown & Sharpe machines, a drive of special type is available which is supported from the floor by a suitable column, which holds a gear box directly above the machine spindle. Such drives may be applied to automatic screw machines when they are being re-built, or they may be purchased separately.

FIGURE 3. A six-spindle screw machine of 1⅝" capacity. Note how accessible the tooling zone is from this side of the machine.

Single spindle Gridley machines may be equipped with the Vari-Drive motor, which offers speeds over a wide range. This is really a compact, self-contained variable speed device, in which a simple squirrel-cage motor is built integral with a variable speed transmission, having the usual contracting and expanding variable-speed disks. The Syncrogear is built into the motor to drive the feed, and there are interconnected magnetic controls which will stop both the Syncrogear and the variable-speed mechanism automatically, in the event that either should stall.

DRIVES ON MULTI-SPINDLE UNITS

The manner in which carefully controlled speeds and motions, properly inter-related, are produced in the various operating components of a modern multi-spindle automatic screw machine, is usually something of a mystery to those who have had little or no opportunity to delve into the matter. So that synchronization will be absolutely maintained, all power for the purpose is derived from one source and is positively transmitted through a gear train. Any inter-relational variations desired between different setups must be obtained by means of change gears, with reference to rotative speeds, and through cams with regard to lineal motions.

Figure 1 shows a gear train for actuating a four-spindle screw machine. This machine is fitted with a tool-carrying slide made in the general form of an *inverted* capital T, the vertical stem of the T carrying four T-slots in line with the four spindles of the machine, horizontally, so that tools may be mounted for end-working operations on each of the four tooling positions.

In Figure 1, the motor which drives the machine and which is conveniently mounted on a shelf at the left-hand end in front is shown schematically and designated as turning 1760 rpm. An enclosed and extended motor shaft reaches all the way across the front of the machine and into the gear box at the right-hand end. This shaft is broken away in Figure 1, however, to avoid confusion through super-imposing it over other vital parts of the train. The center line is carried through, and leads to a 26-tooth motor pinion at the other end of the shaft. This pinion drives a 50-tooth

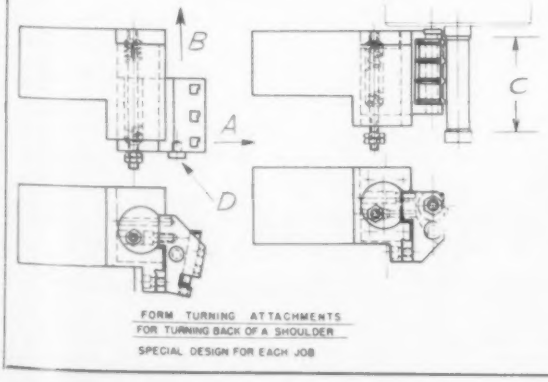


FIGURE 4.

Two form-turning attachments for turning back of shoulder. These are typical double-action tools, capable of imparting two different motions to the same cutters at the same cycle.

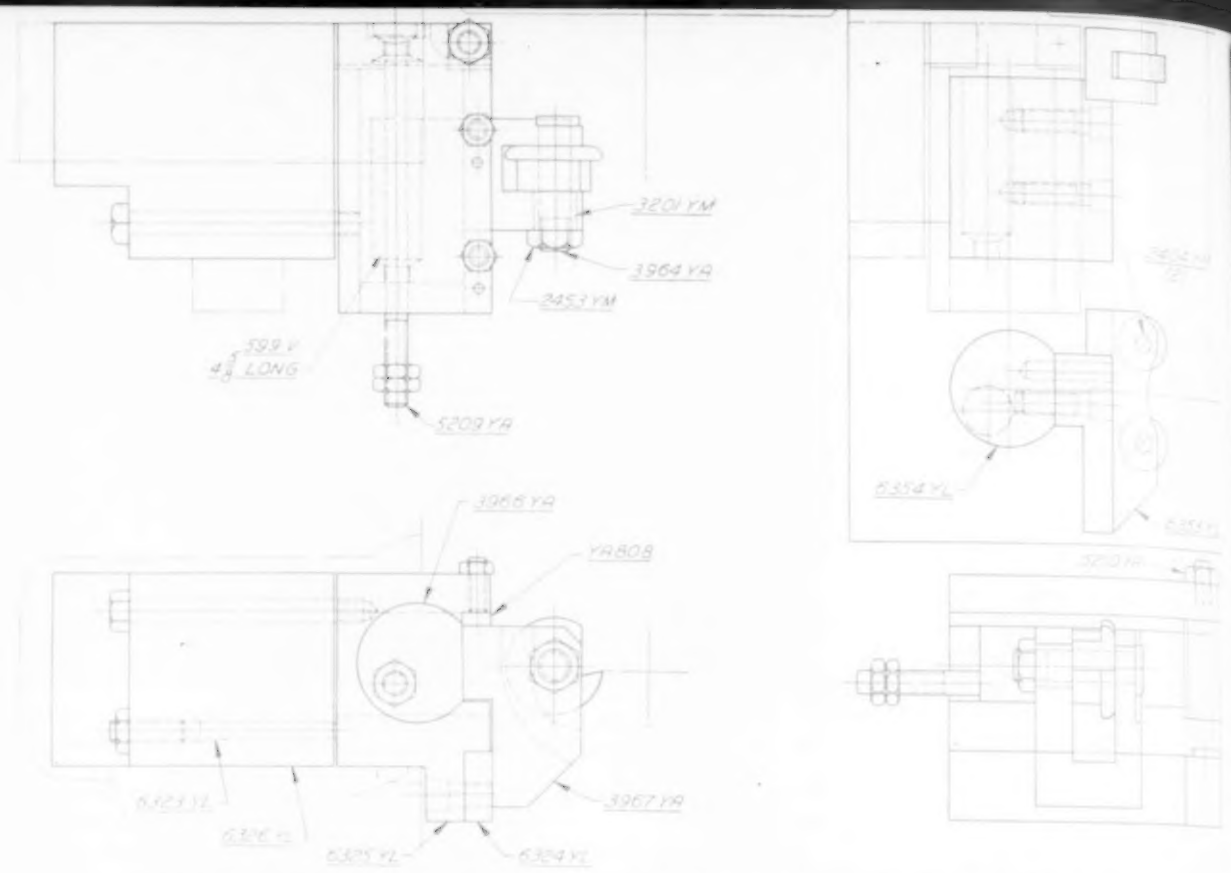


FIGURE 5. A double-action form turner of a general type. A compression spring which offers resistance to movement of the sliding tool holder is not shown. Small circular tool is designed to produce a small fillet at the point of in-feed, and a much larger fillet at the end of the cut. In the inset drawing appear the necessary modifications to the tool to permit knurling behind a shoulder.

gear on a short intermediate shaft, at the other end of which is a 30-tooth gear. The 30-tooth gear drives a 99-tooth gear freely mounted on the main clutch shaft.

From the 99-tooth gear, actuation is derived for the lubricant drive, the coolant drive, and for a 55-tooth gear leading into the train. The 55-tooth gear is on a short intermediate shaft arranged in parallel with another, so that speed changes for the spindle may be made available at this point by using different sizes of spindle speed change gears. A door in the machine frame permits easy access to these change gears. The gears placed on these two shafts at the end, with reference to their ratio, directly determine the spindle speed that will be derived from the original 1760 rpm. of the motor.

From this point in the gear train, the drive branches in two directions, one going to the spindles and the other to the feed mechanism. The change gears drive the 65-tooth gear shown, which in turn drives a 61-tooth gear mounted on the spindle drive shaft. The far end of this drive shaft carries a 51-tooth gear that meshes with the four spindle gears of 41 teeth each, driving them all in the same direction and at the same speed.

The last change gear shaft carries on its far end a 2-thread worm, which actuates a 30-tooth worm-wheel at right angles. The shaft on which this worm-wheel is mounted leads to another pair of change gears employed to vary the speed of the feed. Thus, the speed of the feed mechanism is directly affected by both pairs of change gears. When the spindle speed change gears are selected to reduce the speed of the spindles a given amount, the feed speed automatically changes in proportion. Ordinarily, this is as it should be. When it becomes desirable, however, to change the ratio of speed as *between* the spindles and the feed, this last pair of change gears, called feed change gears and accessible through a door in the front of the machine frame, is put in mesh.

The last one of these change gears has a shaft which supports a four-thread, left-hand worm, the latter driving a 60-tooth worm-wheel mounted on the main clutch shaft. At the far end, this shaft carries a 6-thread worm which engages a 55-tooth worm-wheel on a shaft above. The shaft on which the 55-tooth worm-wheel is mounted, carries at its center a highly ingenious intermittent gear which actuates the main tool slide both forward and backward. Also, it carries 17-tooth bevel gears at its two ends, which engage identical bevel gears at the ends of two camshafts in parallel with one another, and on opposed sides of the machine. On these two camshafts are carried the cams for actuating the cross tool-slides, and indicated in Figure 1 as forming cams.

The rear camshaft carries the indexing gear for the spindle carrier, and also the locking cam for the spindle carrier. In this entire layout, once the change gears have been selected and mounted and the proper cams mounted and set, it is not possible for any part to get out of time. The hand feed worm shown is in engagement with the wormwheel only when it is desired to crank and actuate the feed by hand crank in setting up.

ACCESSIBILITY IS NOTABLE

The gear train shown is for a four-spindle machine, but the six-spindle

units are similar in most respects. The four-spindle unit is wide open above the main tool slide and the tooling zone. The six-spindle unit is connected across the top by a suitable section of framing — to give it additional strength against thrust. All of the machines, however, feature ready accessibility to the tooling zone. This can be seen readily in the photographs, all of which show six-spindle units. Figure 2 shows that the spindle drive shaft, transmitting power from the gear box at the right to the spindles at the left, passes directly through a hole in the main tool slide.

In the six-spindle machine of 1-5/8" capacity, Figure 3, the tooling zone is readily accessible from the side where the operator is miking a piece of work.

DOUBLE-ACTION TOOLING

Double-action tools impart two different motions to the same cutters or tools at the same cycle. Such tools are mounted in suitable holders on one of the cross-slides, and are fed in to the required depth by the cross-slide in the regular manner. At the point of greatest depth, a dwell is provided on the cross-slide cam to hold the slide while a pusher on the advancing end tool slide engages a portion of the tool holder that is designed to slide laterally toward the spindles against the resistance of a housed compression spring. This permits turning or knurling behind a shoulder on the workpieces, or making of certain types of undercuts that would otherwise be highly difficult or impossible to produce.

A clear idea of what is meant by such tooling is shown in Figure 4. Two different tools, one with a straight cutter and the other with circular cutters, embrace the same general design. The tool-holder shown in the two views at the left is in normal position. The cylindrical part, together with the forward portion of the device which holds the cutters, will slide as a unit in the direction of the arrow B against the resistance of the compression spring housed within. Normally, the compression spring holds the sliding portion of the device tight against the two locked nuts as shown.

In operation, the cross-slide in which this holder is mounted carries it forward in the direction of the arrow A until it has reached the predetermined depth for which it is set. Then, the cross-slide dwells, and the advancing end tool-slide engages the sliding portion at D, pushing it in the direction of the arrow B.

The two right-hand views clarify this description by showing the workpiece. Four circular cutters are shown mounted in a gang in such a tool, for a straight turning job back of a shoulder. The tool is shown at the end of the cut, after having traveled in both the directions as cited. Though travel in the direction of the arrow B was relatively short, the entire span C has been turned, because of the four spaced cutters having been used. Such a set-up will likely leave some marks on the work from the cutters, and if a high finish is desired, a smoothing tool should be used at a succeeding position.

A little thought will show that a sliding mechanism of the type shown may be actuated on a line out of parallel with the axis of the workpiece. Consequently, it may be used for taper turning, combined forming and turning, and other out-of-the-ordinary applications behind a shoulder on the workpiece.

Figure 5 shows a form turner of this general type, drawn with just a bit less detail, the pocket alone and not the compression spring proper being shown. Only one circular tool is mounted, and it is shaped to produce a small fillet at the point of infeed, and a much larger fillet at the end of the cut. In the insert square at the upper right-hand corner of this figure are details of the necessary modifications for knurling behind a shoulder.

SHAVING TOOL HOLDER

A highly ingenious screw machine tool of this type, and very much out of the ordinary, is a shaving tool holder. The cutter is held in vertical position, contrary to the arrangement found in most shaving tools. Through the side plate is a setscrew to take widthwise play out of the cutter, and through the cap plate are two setscrews to hold the cutter in just the right position and prevent it from crowding back.

An interesting means is used for adapting the holder to cutters of different thicknesses, and also for accurately setting the forward position of the cutter over the exact center of the work while the second or endwise motion is in process. A special screw is slotted for manipulation with a screwdriver, and is shouldered to bear against a wedge. The wedge is drilled to allow free passage of the screw body, but its mating wedge is tapped through to receive the threaded end of the screw.

The wedges are set against beveled seats milled in the body of the holder. Pulling them together with the screws moves them toward the cutter any desired amount, and such leeway as may be found desirable for the purpose may be provided with the front cap. The screw will, of course, move forward in common with the wedges, and a slot is provided in one side plate to allow such movement of the screw head. A slot of smaller size is provided in the other side plate to house and allow similar motion on the other end of the screw.

The use of a shaving tool presumes a roughing cut in a preceding position. A hollow milling operation might take place, followed by a special tool of hollow-milling type for making the major portion of the undercut in the shoulder of the work.

THE END

A series of articles on
SCREW MACHINE DESIGN

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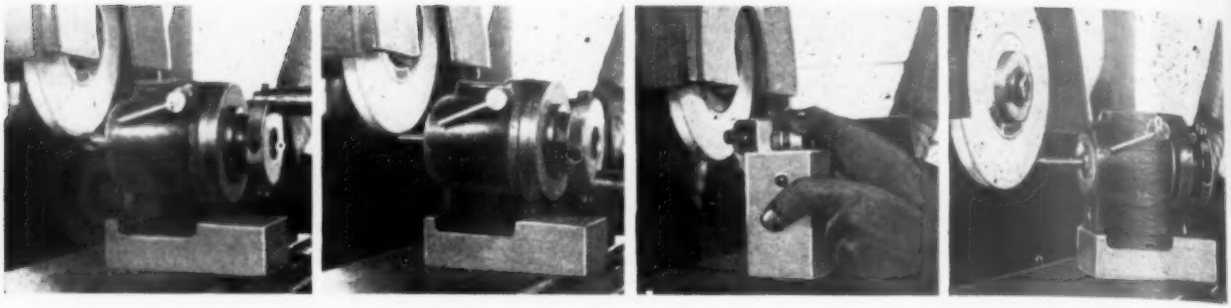
This series of articles on screw machine designs, tools and attachments, being published in alternate issues, covers important aspects of every phase of the field.

While most production engineers want to know what range of work can be expected from the many types of equipment, relatively few are called upon to design screw machines or screw machine tools.

Part of this second article in the series explores the possibilities of rebuilding and modernization. Along that line, readers faced with problems of modernization would do well to consult reputable rebuilders.

RAPID GRINDING OF TOOLS



With curtailed delivery of essential tools to individual plants, tool engineers have had to find practical methods of producing needed tools.

Without adding to the grinding equipment on hand, it is possible to develop required precision on a circular grinder through the use of an indexing head. This article describes the methods employed for producing die punches, counterbores, and form cutters for screw machines. It also reveals the possibilities for internal and external grinding of dies on a surface grinder.

RALPH H. CHUTE
THE UCINITE COMPANY

PUNCHES

● PUNCHES are turned, leaving .010" to grind, then hardened and tempered. The index head is prepared for grinding by backing the index pin into idle position, and holding it out with a thumb screw. A handle is attached through holes in the index drawbar.

The grinding wheel is dressed, including development of whatever radius may be desired. The index head is placed on a magnetic chuck, square with the back brace, and the work piece is chucked in the head. This permits either straight or tapered grinding.

In the grinding procedure, the head spindle is turned simultaneously with front to rear table movement. If a tapered, or pilot, punch is desired, the index head is set at an angle, and, either the face or side of the wheel is used.

The previous method of grinding punches, using a grinding attachment on a lathe, proved unsatisfactory because of roughness and chatter marks.

The smallest size punch ground by this method, using a surface grinder with an index head, was an .045" punch for a compound die.

COUNTERBORES

● COUNTERBORES, applied to production of parts from Bakelite, or for tool crib use, are ground from hss. drills. A slow twist drill is preferred but good results have been obtained with a faster twist by providing a sharp, square edge on the wheel.

The wheel is dressed, both face and side, to a sharp edge. The full width of the pilot on the counterbore is ground, .001" at a time, so as not to round the corner of the wheel. When large counterbore is used, the drill is rough ground on hand grinder.

After grinding the pilot, the cutting lips are backed off by swinging the index head at a 10° angle, using the same elevation on the grinding wheel. In this operation, the drill is rotated through a short arc to permit the wheel to engage the entire surface of the tooth behind the cutting edge.

FORM CUTTERS

● CIRCULAR form cutters are made from hss. rough turned on a lathe and hardened. The grinding of form cutters involves a more difficult problem because diameters and widths must be held to close dimensions with back clearance on cutting steps. This means that the cutter must be held at definite angles for grinding.

Before grinding, the wheel is dressed at the same angle in which the cutter is to be held, which is 3°, using the same holder for dressing wheel and for a foot to hold the index head. This allows the flat cuts to be level, at the same time providing proper clearance for cutting the steps.

To secure these cutters from outside sources involves a delivery date of about eight weeks. Using the method described above, a form cutter can be produced for screw machine application within a few days.

INTERNAL GRINDING

● INTERNAL GRINDING with attachments to a surface grinder is less practiced than the other applications described here, because it does not speed the operation over conventional methods. However, it has a chance for improvement, and if it is necessary to restrict grinding to one machine, internal grinding can be performed with a Liberty high speed unit, or similar attachment. Using the index head as a holder, the outside diameter is ground first. THE END

...Any "JAPANESE WRITING" *In Your Shop?*

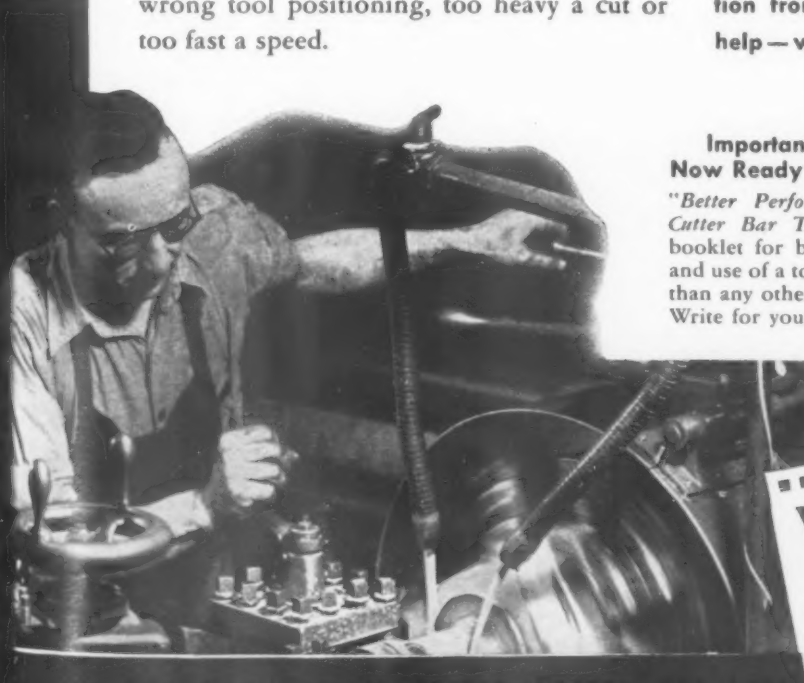
"CHINESE WRITING", shopmen used to call it—a humorous, vivid description of the marks, gouges, and scratches on a work piece, caused by an inaccurate machine, improper tool setting or careless workmanship.

But today "Japanese writing" is the new and more appropriate term for these shop errors because every scrapped piece, or time lost in unnecessary grinding and refinishing operations, hurts America and helps Japan.

A number of things can cause "Japanese writing" in turret lathe turning operations—inaccuracies because of worn parts, improperly ground cutters, incorrect type of tool, wrong tool positioning, too heavy a cut or too fast a speed.

And these factors can be licked—probably very easily. A Warner & Swasey field engineer can help you do it by on-the-spot diagnosis. Also available to turret lathe departments are the Turret Lathe Operator's Manual, Turret Lathe Rebuilding Booklet, Tool Catalog, Bar Turner Booklet, Cutter Grinding Educational Motion Picture, Feed and Speed Calculator—and to your operators, "Blue Chips", a shop bulletin written especially for turret lathe operators that brings valuable, practical information, tips, short-cuts, etc.

If you have trouble with "Japanese writing" or any other work spoilage that slows production from your turret lathes, perhaps we can help—write Warner & Swasey, Cleveland, Ohio.



Important New Booklet Now Ready for Distribution—

"Better Performance from Single Cutter Bar Turners"—a 32-page booklet for better understanding and use of a tool that is used more than any other tool for bar work. Write for your copies!

WARNER & SWASEY FOR VICTORY

TAPPERS
TAPPERS
Jarvis
POWER TOOLS
TAPPERS
TAPPERS
THE CHARLES L. JARVIS COMPANY
TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES
Middletown, Conn.

Your child's best friend...

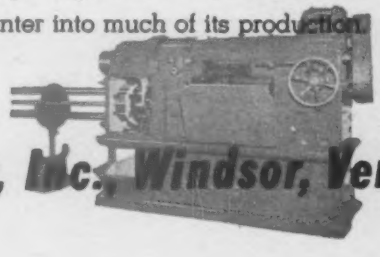
THE PARASITIC FRUIT FLY, Drosophila, is perhaps the most important creature in the world to scientists today. Because its study may reveal what the character of our own children may be in the future.

Drosophila is a perfect specimen for laboratory study, because a generation flickers past in from 8 to 12 days. As a result, scientists have been able to study and record a million breedings! And the entire mechanism of heredity has thus been revealed!

But if Drosophila is a friend to mankind, consider the influence of machine tools on human welfare. Do you know why it is that some countries, so rich in natural resources, still harbor hundreds of millions living close to starvation? And why the highly industrialized countries represent the greatest advance in civilization? The answer is machine tools!

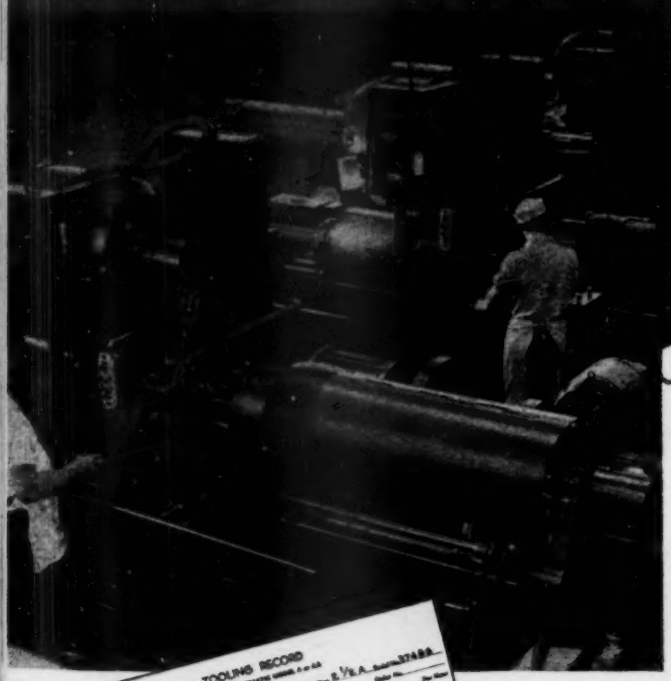
Machine tools have vastly increased the output of manufacturers and have shortened the customary hours of labor. They have **not** reduced the number of persons required to do the world's work. They **have** eliminated much of the back-breaking labor which would otherwise be required.

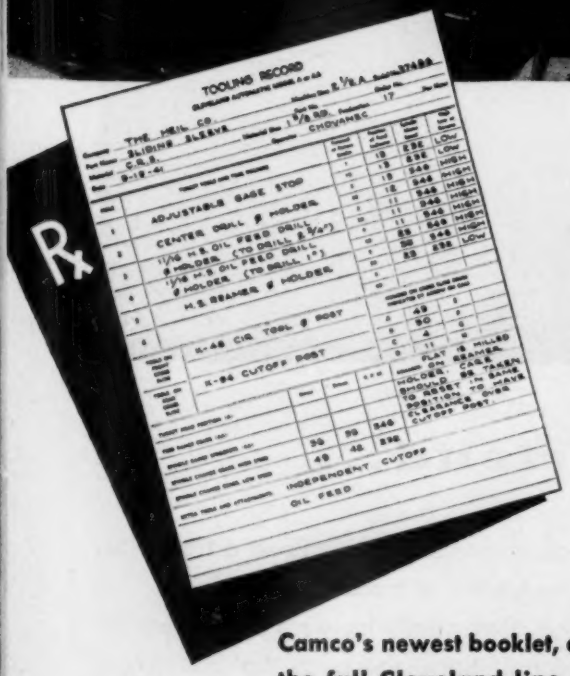
Cone Automatic Machine Company is proud to be a part of such an essential industry. Proud, also, to know that whatever we Americans build for the future. Cone Multiple Spindle Automatic Lathes will most certainly enter into much of its production.



CONE Automatic Machine Company, Inc., Windsor, Vermont

Prescription for Profitable Production





Camco's newest booklet, describing the full Cleveland line of Single Spindle Automatics, has just been released. It contains information you will find interesting, whether you are production man or president.

COSTS very often get out of control on jobs which, for one reason or another, go into production and out . . . and back again. Set-up time, even on modern machines, can run up the bill, as every production man knows.

That's just another kind of a job on which Cleveland Universal Camming can make surprising savings. In the first place, *set-up time per operation* is reduced to a remarkable minimum by the simplicity and accessability of all controlling cams. Secondly, the speed with which Clevelands *complete several operations* is such that savings over other methods *commence with the first few pieces* finished and increase in proportion to the number produced.

Because of the accurate scaling and simple adjustments of the universal cams which control all operations, the set-up man can keep an exact record of every setting. This he uses as a sort of "prescription", if the job goes back on the machine, to re-tool with a great saving over the original set-up time.

That's the sort of saving that contributes to profitable production.

Remember, Clevelands Cut Costs

THE CLEVELAND AUTOMATIC MACHINE COMPANY

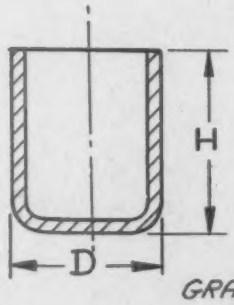
CLEVELAND, OHIO

SALES OFFICES

CHICAGO: 1408 Civic Opera Building
DETROIT: 540 New Center Building
NEWARK: 902 American Insurance Building
CINCINNATI: 1315 American Building

PRODUCTION DATA SHEET

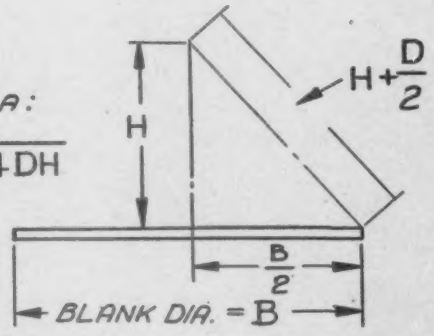
DEEP DRAWING DESIGN DATA

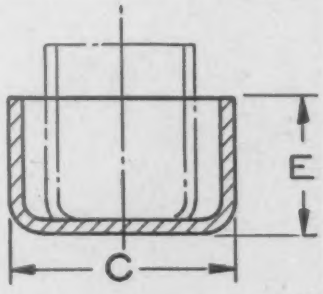


GRAPHICAL METHOD OF DETERMINING BLANK DIA. OF CUP

FORMULA:

$$B = \sqrt{D^2 + 4DH}$$





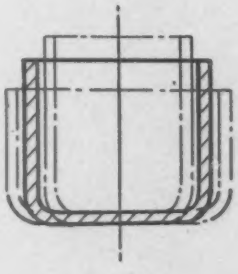
DIMENSIONS OF FIRST DRAW

$$C = \frac{\text{DIA. OF BLANK}}{2}$$

$$E = \frac{3}{4} C$$

PERCENTAGE REDUCTION OF DIAMETER "C"

BASED ON THICKNESS AND MATERIAL



THICKNESS	ALUM. & STEEL	BRASS
1/16	20%	30%
1/8	15%	24%
3/16	12%	18%
1/4	10%	15%
5/16	8%	12%

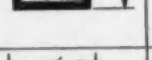
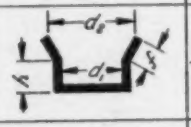
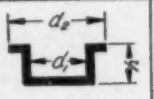
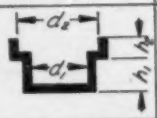
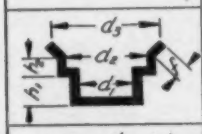
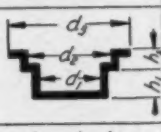
SCARCITY of materials makes mandatory the exact calculation of stock dimensions so as to hold scrap resulting from machining operations at a minimum. In no branch of production engineering is this more important than in the figuring of sheet sizes and diameters for deep drawn shells and cups.

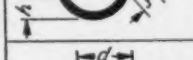
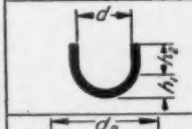
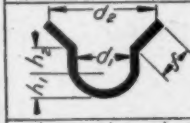
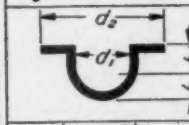
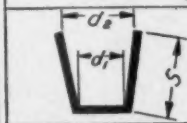
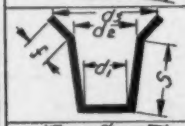
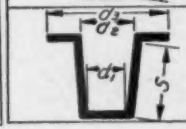
Today, busy engineers without data from their own experience are likely to figure roughly and to allow a costly margin to play safe.

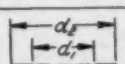
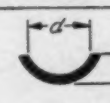
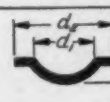
Data listed on these two pages should help allay this source of waste. The graphic method for determining blank diameters and the formulas for finding areas and blank diameters of specific shapes of drawn shells are used by the General Electric Company at Schenectady.

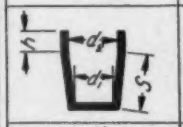
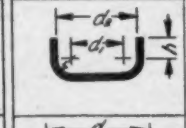
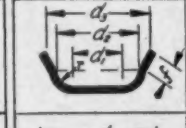
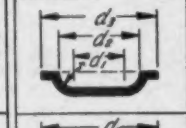
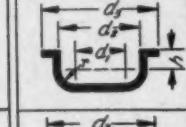
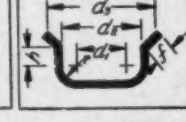
NOTE: On this page is the twenty-third of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

FORMULAS FOR AREAS AND BLANK DIAMETERS OF DRAWN SHELLS

	AREA OF BODY 'A' =	DIA. OF BLANK 'D' =
	$\frac{\pi d^2}{4} + \pi d h$	$\sqrt{d^2 + 4dh}$
	$\frac{\pi d_1^2}{4} + \pi d_1 h + \pi f \frac{d_1 + d_2}{2}$	$\sqrt{d_1^2 + 4d_1h + 2f(d_1 + d_2)}$
	$\frac{\pi d_1^2}{4} + \pi d_1 h + \frac{\pi}{4}(d_2^2 - d_1^2)$	$\sqrt{d_1^2 + 4d_1h + d_2^2 - d_1^2} = \sqrt{d_2^2 + 4d_1h}$
	$\frac{\pi d_1^2}{4} + \pi d_1 h_1 + \frac{\pi}{4}(d_2^2 - d_1^2) + \pi d_2 h_2$	$\sqrt{d_2^2 + 4(d_1h_1 + d_2h_2)}$
	$\frac{\pi d_1^2}{4} + \pi d_1 h_1 + \frac{\pi}{4}(d_2^2 - d_1^2) + \pi d_2 h_2 + \pi f \frac{d_2 + d_3}{2}$	$\sqrt{d_3^2 + 4(d_1h_1 + d_2h_2) + 2f(d_2 + d_3)}$
	$\frac{\pi d_1^2}{4} + \pi d_1 h_1 + \frac{\pi}{4}(d_2^2 - d_1^2) + \pi d_2 h_2 + \frac{\pi}{4}(d_3^2 - d_2^2)$	$\sqrt{d_3^2 + 4(d_1h_1 + d_2h_2)}$
	$\frac{\pi d^2}{2}$	$\sqrt{2d^2} = 1.414\,d$

	AREA OF BODY 'A' =	DIA. OF BLANK 'D' =
	$\frac{\pi}{4}(d_1^2 + 4h^2) + \pi f \frac{d_1 + d_2}{2}$	$\sqrt{d_1^2 + 4h^2 + 2f(d_1 + d_2)}$
	$\frac{\pi}{4}(d^2 + 4h_1^2) + \pi d h_2$	$\sqrt{d^2 + 4(h_1^2 + dh_2)}$
	$\frac{\pi}{4}(d_1^2 + 4h_1^2) + \pi d_1 h_2 + \pi f \frac{d_1 + d_2}{2}$	$\sqrt{d_1^2 + 4\left[h_1^2 + d_1 h_2 + \frac{f}{2}(d_1 + d_2)\right]}$
	$\frac{\pi}{4}(d_1^2 + 4h_1^2) + \pi d_1 h_2 + \frac{\pi}{4}(d_2^2 - d_1^2)$	$\sqrt{d_2^2 + 4(h_1^2 + d_1 h_2)}$
	$\frac{\pi d_1^2}{4} + \pi S \frac{d_1 + d_2}{2}$	$\sqrt{d_1^2 + 2S(d_1 + d_2)}$
	$\frac{\pi d_1^2}{4} + \pi S \frac{d_1 + d_2}{2} + \pi f \frac{d_2 + d_3}{2}$	$\sqrt{d_1^2 + 2\left[S(d_1 + d_2) + f(d_2 + d_3)\right]}$
	$\frac{\pi d_1^2}{4} + \pi S \frac{d_1 + d_2}{2} + \frac{\pi}{4}(d_3^2 - d_2^2)$	$\sqrt{d_1^2 + 2S(d_1 + d_2) + d_3^2 - d_2^2}$

	AREA OF BODY 'A' =	DIA. OF BLANK 'D' =
	$\frac{\pi d_1^2}{2} + \frac{\pi}{4}(d_2^2 - d_1^2)$	$\sqrt{d_1^2 + d_2^2}$
	$\frac{\pi d_1^2}{2} + \pi f \frac{d_2 + d_1}{2}$	$1.414\sqrt{d_1^2 + f(d_2 + d_1)}$
	$\frac{\pi d^2}{2} + \pi d h$	$1.414\sqrt{d^2 + 2dh}$
	$\frac{\pi d_1^2}{2} + \pi d_1 h + \frac{\pi}{4}(d_2^2 - d_1^2)$	$\sqrt{d_1^2 + d_2^2 + 4d_1h}$
	$\frac{\pi d_1^2}{2} + \pi d_1 h + \pi f \frac{d_1 + d_2}{2}$	$1.414\sqrt{d_1^2 + 2d_1h + f(d_1 + d_2)}$
	$\frac{\pi}{4}(d^2 + 4h^2)$	$\sqrt{d^2 + 4h^2}$
	$\frac{\pi}{4}(d_1^2 + 4h^2) + \frac{\pi}{4}(d_2^2 - d_1^2)$	$\sqrt{d_2^2 + 4h^2}$

	AREA OF BODY 'A' =	DIA. OF BLANK 'D' =
	$\frac{\pi d_1^2}{4} + \pi S \frac{d_1 + d_2}{2} + \pi d_2 h$	$\sqrt{d_1^2 + 2S(d_1 + d_2) + 2d_2h}$
	$\frac{\pi d_1^2}{4} + \frac{\pi^2 r}{2}(d_1 + 1.274r)$ OR $\frac{\pi}{4}(d_2 - 2r)^2 + \frac{\pi^2 r}{2}(d_2 - 0.726r)$	$\sqrt{d_1^2 + 6.28rd_1 + 8r^2}$ OR $\sqrt{d_2^2 + 2.28rd_2 - 0.56r^2}$
	$\frac{\pi d_1^2}{4} + \frac{\pi^2 r}{2}(d_1 + 1.274r) + \pi h d_2$ OR $\frac{\pi}{4}(d_2 - 2r)^2 + \frac{\pi^2 r}{2}(d_2 - 0.726r) + \pi h d_2$	$\sqrt{d_1^2 + 4(1.5\pi d_1 + 2r^2 + hd_2)}$ OR $\sqrt{d_2^2 + 4d_2(h + 0.57r) - 0.56r^2}$
	$\frac{\pi d_1^2}{4} + \frac{\pi^2 r}{2}(d_1 + 1.274r) + \pi f \frac{d_1 + d_2}{2}$ OR $\frac{\pi}{4}(d_2 - 2r)^2 + \frac{\pi^2 r}{2}(d_2 - 0.726r) + \pi f \frac{d_2 + d_3}{2}$	$\sqrt{d_1^2 + 6.28rd_1 + 8r^2 + 2f(d_2 + d_3)}$ OR $\sqrt{d_2^2 + 2.28rd_2 + 2f(d_2 + d_3) - 0.56r^2}$
	$\frac{\pi d_1^2}{4} + \frac{\pi^2 r}{2}(d_1 + 1.274r) + \frac{\pi}{4}(d_3^2 - d_2^2)$ OR $\frac{\pi}{4}(d_2 - 2r)^2 + \frac{\pi^2 r}{2}(d_2 - 0.726r) + \frac{\pi}{4}(d_3^2 - d_2^2)$	$\sqrt{d_1^2 + 6.28rd_1 + 8r^2 + d_3^2 - d_2^2}$ OR $\sqrt{d_3^2 + 2.28rd_2 - 0.56r^2}$
	$\frac{\pi d_1^2}{4} + \frac{\pi^2 r}{2}(d_1 + 1.274r) + \pi d_2 h + \frac{\pi}{4}(d_3^2 - d_2^2)$ OR $\frac{\pi}{4}(d_2 - 2r)^2 + \frac{\pi^2 r}{2}(d_2 - 0.726r) + \pi d_2 h + \frac{\pi}{4}(d_3^2 - d_2^2)$	$\sqrt{d_1^2 + 6.28rd_1 + 8r^2 + 4d_2h + d_3^2 - d_2^2}$ OR $\sqrt{d_3^2 + 4d_2(.057r + h) - 0.56r^2}$
	$\frac{\pi d_1^2}{4} + \frac{\pi^2 r}{2}(d_1 + 1.274r) + \pi d_2 h + \pi f \frac{d_2 + d_3}{2}$ OR $\frac{\pi}{4}(d_2 - 2r)^2 + \frac{\pi^2 r}{2}(d_2 - 0.726r) + \pi d_2 h + \pi f \frac{d_2 + d_3}{2}$	$\sqrt{d_1^2 + 6.28rd_1 + 8r^2 + 4d_2h + \frac{\pi f}{(d_2 + d_3)}}$ OR $\sqrt{d_2^2 + 4d_2(.057r + h + \frac{f}{2}) + \frac{2d_2f}{0.56r^2}}$

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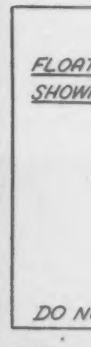

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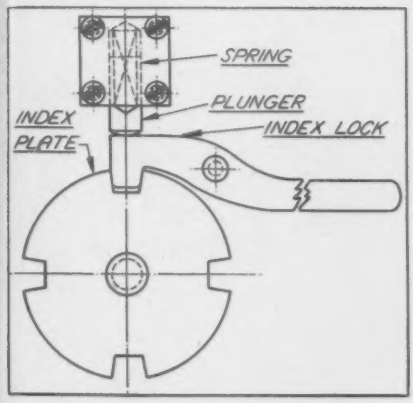
Simple Index Lock Easy to Operate



THE INDEX LOCK shown is simple and easy to operate. Fulcrum of lever should be in line with O. D. of the index plate. The plunger, directly over the lock, insures positive lock and maximum pressure, while the leverage makes for easy operation.

Removing Aluminum Chips with Cutting Fluid

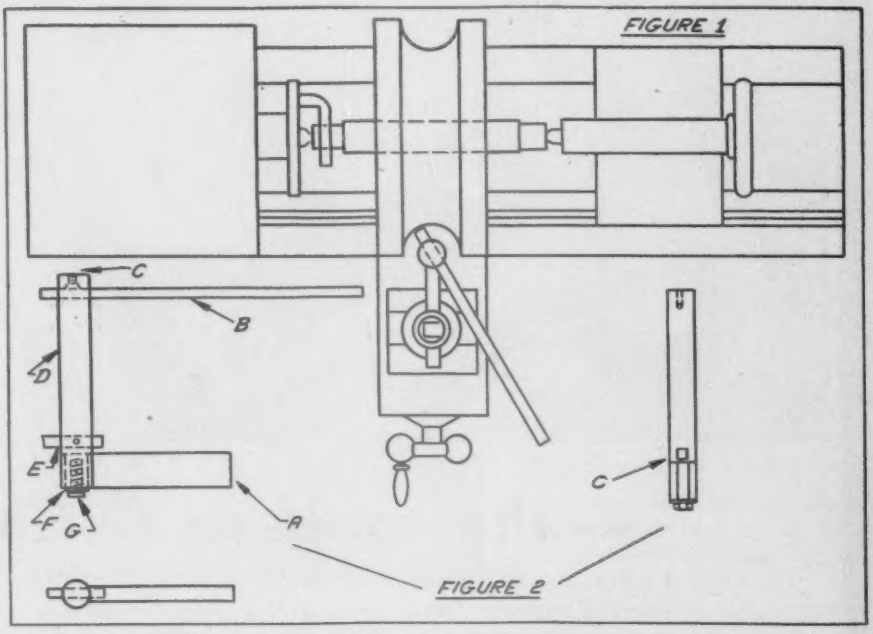
USING the conventional air hose to clean your machine of aluminum chips frequently results in blowing the light particles all over the machine and the floor. On certain applications, machine operators in plants of the Wright Aeronautical Corporation have found that a stream of coolant does a better job. Oil is captured and recirculated.

Simple, Adjustable Tool for Radius Cuts on Your Lathe

WHEN A RADIUS cut on a lathe is desired, it can be done without making a form tool by using a simple, adjustable tool construction such as is shown in Drawing 1. The cutting tool is moved on an arc to form the desired radius.

In Drawing 2, a bar is made of cold rolled steel and is shaped to fit the lathe tool post holder. A hole is drilled in the large end into which the bar D Fits. Bar D is round and turned on the end which fits into and shoulders on bar A. A square hole is cut about 1/8" above the shoulder to accommodate the standard tool Bit E.

Tool bit E and bar B, located at the top end of bar D, are held in place by small set screws C. The bottom end of bar D is topper for a cap screw G. Cap screw G and washer F hold bar D so that it can turn in bar A. This ingenious lathe tool makes possible the cutting of smooth and accurate radii. Thus one device eliminates the need for numerous form tools.

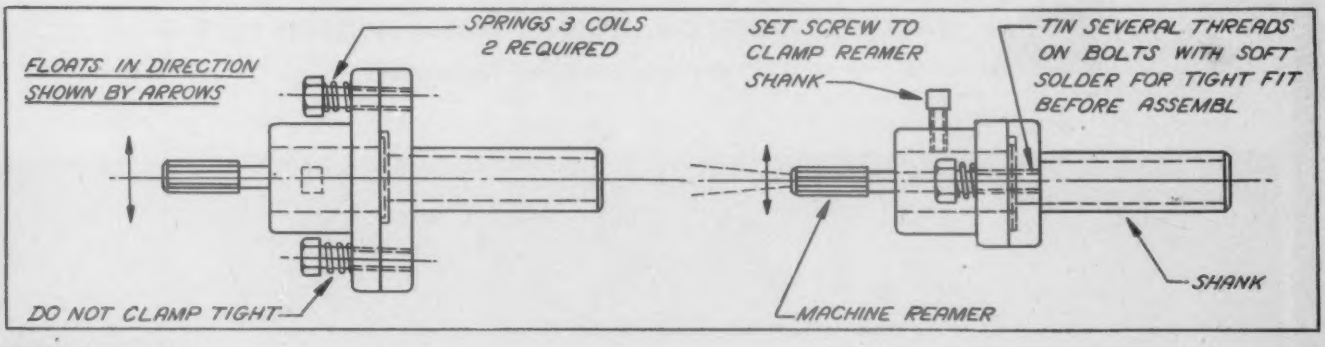


B & S Adjustable Drill Holder Converted to Hold Floating Reamer

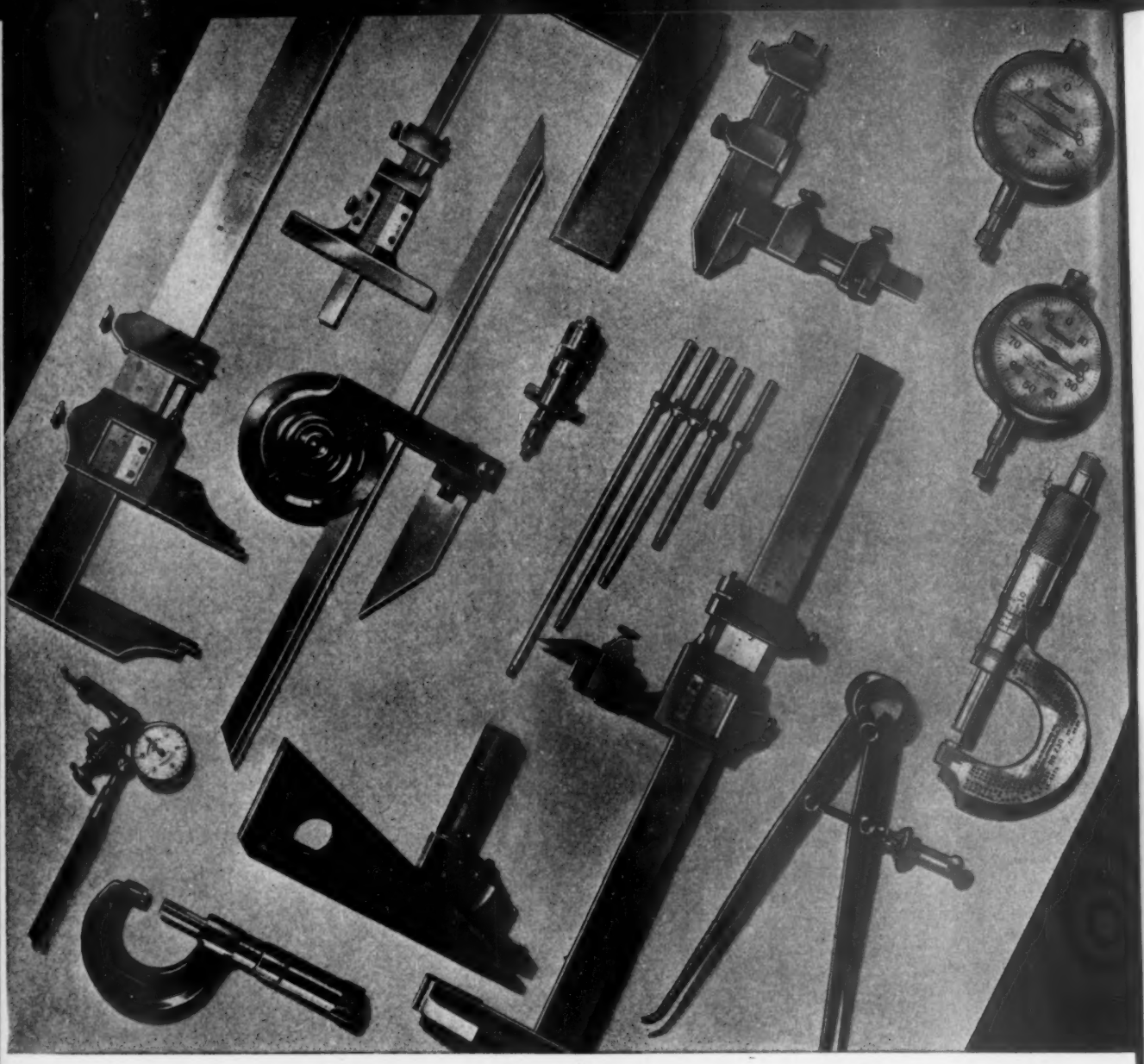
IN MAKING bushings on automatic or hand screw machines, center drills and drills are usually short and produce a concentric hole. A floating reamer holder can be applied to correct this condition and maintain very close tolerances.

The holder shown is easy to make. The moving portion is not heavy enough to produce a bell-mouthed hole. The reamers are honed to size, and holes can be finished to a plus or minus .0005". The size of reamers used range from 1/8" to 5/8" diameter.

Drawing shows the adaptation of a standard Brown & Sharpe adjustable drill holder to make a floating reamer holder.


FLOATS IN DIRECTION SHOWN BY ARROWS
SPRINGS 3 COILS 2 REQUIRED
SET SCREW TO CLAMP REAMER SHANK
TIN SEVERAL THREADS ON BOLTS WITH SOFT SOLDER FOR TIGHT FIT BEFORE ASSEMBL
DO NOT CLAMP TIGHT
MACHINE REAMER
SHANK

STARRETT TOOLS



--- the tools to finish the job!

Fashioning the Micrometers, the Vernier Gages, the Dial Indicators and countless other Precision Tools essential for war production continues to demand the supreme and sustained efforts of every member of the Starrett organization . . . We must maintain Starrett standards of accuracy and workmanship in order that Starrett Tools may contribute the essential speed, precision and confidence to skilled and loyal hands . . . We must do our utmost to get these tools into those hands that count most heavily toward the successful conclusion of the one big job ... To that end your mill supply distributor is performing an invaluable service. You can continue to rely on him for efficient, dependable assistance on all matters of precision tool procurement.

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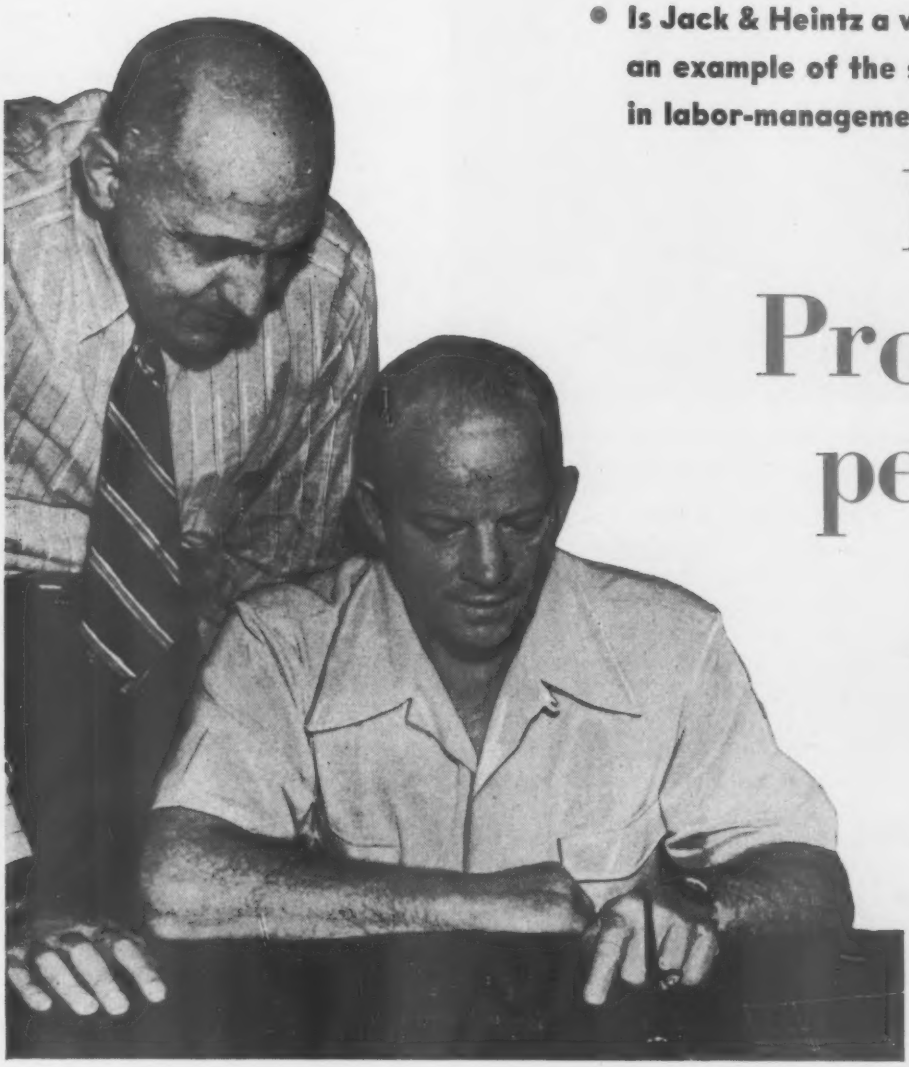
MEN • MATERIALS • MACHINES

• Is Jack & Heintz a war-time side show — or an example of the shape of things to come in labor-management relations?

More Production per Man

Here is a story for production engineers on the manufacturing methods and employee relations which have made Jahco an industrial phenomenon



• Bill Jack (seated) and Ralph Heintz

One a former machinist, the other an inventive genius, they are the founders and motivating forces in Jahco.

WALLACE A. SCOTTEN
ASSOCIATE EDITOR

CHARLIE ROSS, a tool grinder, shut off his machine and turned to a nearby worker in one of Jack and Heintz five big plants. "Bill," he said, "I'm going over and have a steam bath."

Actually, Charlie never said any such thing. Nonetheless, this impression has been written into so many popular accounts of Bill Jack and his 7,200 "associates" in Cleveland and Bedford, Ohio, that this super-producing organization is visualized a "paradise" by millions of workers and an enigma by conventional industrial management.

The accomplishments of Jack and Heintz in war production are a matter of record. Investigated by a congressional committee, the concern received the commendations of the legislators. Repeatedly, it has heard the huzzas of appreciative Army and Navy procurement officers.

Manufacturers of airplane starters, automatic pilots and other aviation equipment, they are outproducing their competitors by as much as two to one and have undersold them by fully one third. The concern is two years ahead of its contract schedule on starter production and is building an automatic pilot which is said to be 25 per cent lighter and 50 per cent cheaper than that of its only competitor in this field. Last year the company's production exceeded $19,000,000.

To learn how dynamic Bill Jack can produce in such volume the complicated products designed by his partner and vice-president, Ralph Heintz, The Tool Engineer talked with both, studied the concern's manufacturing methods and talked with dozens of men and women in a wide range of skills in all of the J & H plants.

From a business standpoint, red tape is kept at a minimum. Cost accounting is adequate, but it is maintained only for the purpose of producing the best possible product at a price that neither permits waste of time nor materials.

From a production standpoint, certain facts are interesting, but not startling. The manufacturing background of J & H is largely metal cutting and metal fabricating, with its

Absenteeism seldom averages more than three-tenths of one per cent. The tardy worker is greeted by an unnerving din of banging tools and cat calls.

products demanding tolerances exceeded in few items produced by American industry for the nation's fighting forces. The aircraft engine starter, designed by Heintz, who is noted as an electrical and mechanical engineer, has been described as more simple from a manufacturing standpoint than others in production today. The flight control instruments produced by J & H, likewise designed by tall, quiet Heintz, are marvels of ingenuity.

Yet the irregular employee relations sponsored by J & H management—Jahco, they call themselves—has had no discernible adverse effect on this exacting type of production. Work performed by the "associates", as everyone including Jack and Heintz call themselves, is typified by the automatic pilot manufacture. This device contains 17,000 parts, 3,000 of which are machined and some of these to the closest tolerances obtainable in production.

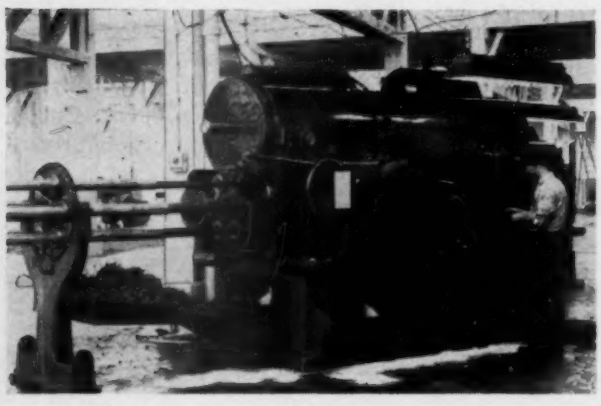
Women, who constitute 40 per cent of the working force, are performing 90 per cent of the inspection and assembly work, and their numbers are growing daily in machining and fabricating departments. On bearing grinding, a large amount of which is done in the production of flight control instruments, 65 per cent of the Van Norman and Brown & Sharpe machines used are operated by women. Likewise, women are matching the production pace of men on turret lathes and big screw machines.

Tooling is flexible in the Jahco plants, it must be admitted, and time and material saving innovations are numerous. If the singing of workers and the blare of jazz music on the plant loudspeaker systems suggest a vast playroom, frequent examples of smart engineering soon counteract the impression.

Consider, for example, a part formerly produced from a forging. During its machining, fully 60 per cent of the weight of the original piece was removed. J. & H production men went to work, devised a new process employing stamping and brazing to produce a superior product in a fraction of the time formerly required.

From a physical standpoint, the only thing on record to have slowed production at J & H since Pearl Harbor has been magnesium and aluminum die castings and steel forgings, all of which are bought outside.

Jack has asserted without contradiction that his associates are turning out more per man, per machine per square foot of factory floor space than any other plant in the nation. A tour of the plants, a half hour's drive outside Cleveland, make it apparent that the story behind the phenomenal production achievements in Bill Jack's shops was somewhere else; for examples of similarly good equipment and methods are legion in war production today.



Speed at Jahco.
Forty-seven working days after ground was broken for a new six and one-half acre plant, this big Cone Automatic machine was in operation.

HIGH WAGES AND LOW ABSENTEEISM

Jahco first made newspaper copy—disregarding the congressional investigation, which was a washout—with fantastically high wages and a startlingly low rate of absenteeism.

Wages of $400 a month for helpers are explained by an average work week for male employees of slightly more than 80 hours. Time and a half for overtime, and a large cut per employee of annual profits is the answer here.

Why many days of any month go by without a single absentee among 7,200 workers, and never more than 22 hours in a 60,000 man-hour day is a more difficult question to answer. The most common explanation of this condition is that J & H forgets to count some of its absentees. That explanation is erroneous.

The first day at J & H convinced us that this is a one-man outfit, that the enthusiasm and imagination of short, stocky ex-labor leader Bill Jack is the driving force in this industrial phenomenon.

Jack is a tired looking man. And well he might be, for his day in the plants average 18 hours, seven days a week. More often than not, he catches his sleep on a cot in the factory.

Packed into the 12 foot square cubbyhole that is his office—open to every man and woman in the shop—is a maze of tools and mechanical gadgets. On one corner of his desk rests the microphone into which he

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Your Distributor has access to the same manufacturing sources that your own Purchasing Department has. He buys in volume—he is an important customer. He buys on the same high priorities that you do—and when his orders go into the factory schedule, no other orders of equal priority can bump them off.

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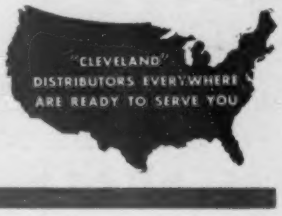

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addresses his associates. Day and night, his voice rings out, "This is Bill Jack calling!" The booming reception those words receive is electrifying, is ample evidence of the esteem in which J & H employees hold him.

He is "Bill" to his top men and the same to the sweeper on the night shift in any Jahco plant. His jovial secretary, Adeline Bowman, has been with him 25 years and knows every machine tool built. The moment she asks your first name and introduces you to "Bill", without the customary "Mister", you begin to feel the spirit that pervades this organization.

While listening to Jack explain the relations between the company and its associates, it is reassuring to recall his record in industry. His previous successes in production and industrial management make it seem reasonable that he knows what he is talking about. Getting his start as a water boy in Cleveland's big steel mills, Jack was successively a machinist and a machinists' union organizer.

Eventually, he opened his own machine shop under the name of The Accurate Machine Company. It was a success. In 1932, he reorganized the Marquette Metal Products Company. This concern's reputation as a producer of precision parts is nationally known. Then, in 1933, he organized the well known Pump Engineering Service Corporation (Pesco).

Selling his interest in Pesco, he launched Jahco in November 1940 with 78 workers, most of them machine hands, a then incomplete building in Bedford and a few machines.

Jazz and production talks

Music, birthday greetings and Bill Jack's production talks are broadcast from a central studio.

It pays dividends! Coffee and doughnuts are served by the company at any hour. A personal touch is the associate's name on his coffee cup.

The job he undertook was the manufacture of an aviation engine starter designed by his friend, Ralph Heintz.

How, we asked Jack pointedly, do you get more pieces per man, per machine hour?

"There is nothing that cooperation between the worker and management won't solve in a production operation," he answered. "Our men are on the honor system. The secret of this system is implanting in the worker's mind the fact that he is not working for the company, but for himself, the man beside him—as well as Jack & Heintz.

"I know from my own experience in the shop that piece work doesn't pay off. You can't convince the worker that if he fattens his pay envelope very long on the piecework system he will not soon find the rate per piece cut. On the other hand, if he knows that the more he produces the greater the company's profits will be and that his cut will be bigger, the more he will turn out per hour.

"As soon as the worker is convinced that by speeding up production he will not work himself out of a job he will turn out more of his own accord than you could ever hope to obtain by excessive wage scales," he said.

Most up-from-the-shop executives would subscribe in theory to this idea, but executing it would be something else. To conventional management the J & H setup smacks of superfluous charity with Johnny Q Public footing the bill during wartime. Facts of the situation prove otherwise. Reduced to the simplest terms, hourly wage rates are comparable with Cleveland industry in general, and every "gift" or service rendered the J & H worker by the company has paid its way—or it has been discontinued.

Wages start at 95 cents an hour for men and 85 cents for women, Applicants for jobs—and there is a waiting list of more than 30,000 in this labor shortage area—are carefully interviewed. They work for a month on a probation basis. If they are temperamentally and emotionally fitted to the eleven and one half hour day which the associates themselves voted to work, they automatically receive union membership and the benefits provided by the company.

The new worker is given a complete physical examination, including full-mouth X-Ray, and his bad teeth have been pulled or filled. Dental work which should be performed immediately to keep a man on the job is provided at all times by the company. He received a $2,500 life insurance policy, a $2,500 accident policy, a health insurance policy covering his family, and a minimum guarantee of $25.00 a week in benefits for eight weeks if he is sick. He receives a new pair of health shoes, and two sets of coveralls with his name embroidered over the right breast and "Jahco" over the heart. Laundry service is free.

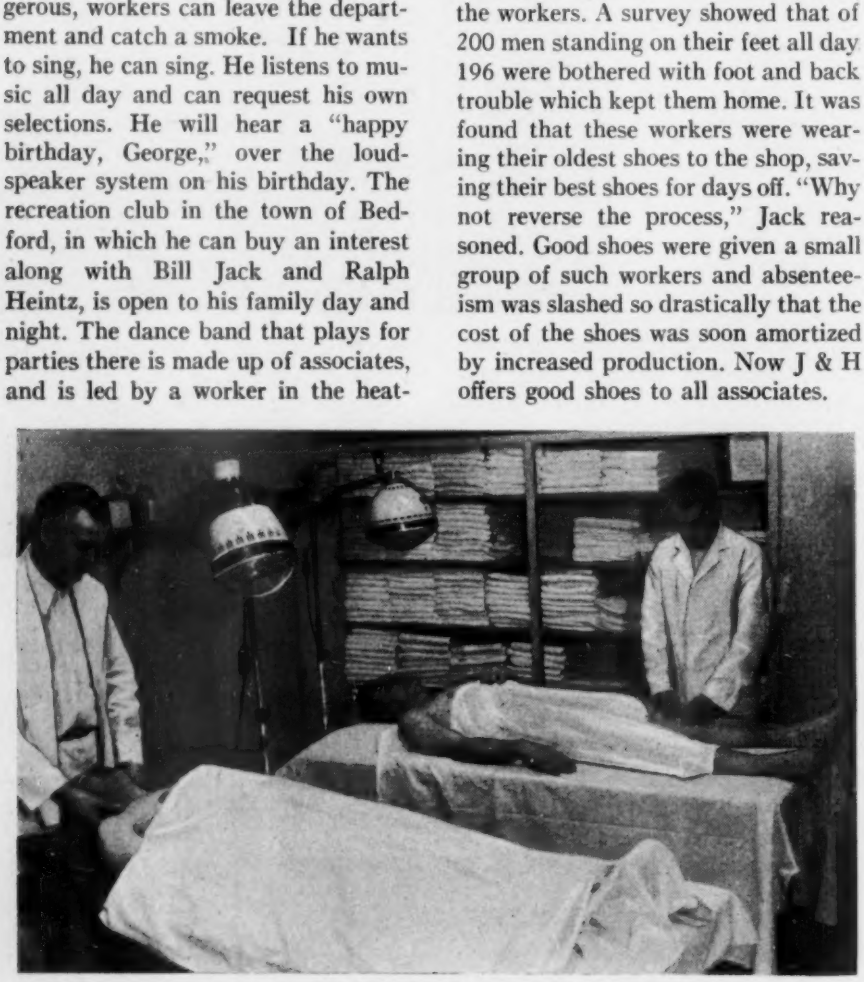
He eats a nutritious, hot lunch provided by the company. At any hour he can enjoy coffee and doughnuts provided by the plant. The cup is his own—with his name on it. If he feels tired, first aid will give him an examination. If physiotheropeutics will help, he is sent to the steam bath.

He does not punch a time clock. If he works overtime—in excess of the basic eleven and one-half hours, his foreman turns in a record of the additional time to the pay office.

If the plant in which he is working meets or exceeds its production quota, he can look forward to a bonus of $50 per month given in an annual bonus

which last year amounted to $300 per associate.

If he wants to smoke, he can smoke. In departments where smoking is dangerous, workers can leave the department and catch a smoke. If he wants to sing, he can sing. He listens to music all day and can request his own selections. He will hear a "happy birthday, George," over the loudspeaker system on his birthday. The recreation club in the town of Bedford, in which he can buy an interest along with Bill Jack and Ralph Heintz, is open to his family day and night. The dance band that plays for parties there is made up of associates, and is led by a worker in the heat-treat department. The bowling alleys are among the finest in the country.



Adequate medical care lowers absenteeism and raises production at Jahco
The first aid department thought physiotheraphy would keep these associates on the job.

In the shop and office, J & H associates work eleven and one-half hours daily, seven days a week. On one Saturday a month, the day shift knocks off at noon and the night shift doesn't report. Saturday evening, fully 7,000 associates gather in one of Cleveland's biggest halls for a banquet and an evening of production pep talks and entertainment. The day crew reports again at seven o'clock Sunday morning and the night shift at seven Sunday evening. Otherwise, the machines and assembly lines at J & H run ceaselessly.

"Tell me," we asked dozens of "associates", "how can you fellows keep up this pace?"

The answer was always the same. "No worries, Buddy".

For every service rendered the employee, Jack can show you how it pays J & H dividends. Every unorthodox policy may be traced to eliminating worry and absenteeism among the workers. A survey showed that of 200 men standing on their feet all day 196 were bothered with foot and back trouble which kept them home. It was found that these workers were wearing their oldest shoes to the shop, saving their best shoes for days off. "Why not reverse the process," Jack reasoned. Good shoes were given a small group of such workers and absenteeism was slashed so drastically that the cost of the shoes was soon amortized by increased production. Now J & H offers good shoes to all associates.

In the case of a hot meal, absentee records showed that a large portion of this industrial ailment can be traced to stomach trouble. Cold food, Jack deduced. He offered workers a hot lunch, and reduced absenteeism and increased vitality more than paid for the lunches.

Dental care provided by the company has saved an estimated 1,500 hours of lost time monthly. First aid and Physiotherapy treatment, by catching embryo colds, has saved an estimated 15,000 man hours monthly.

Research on war production in the United States and England indicates that the quality of work, the quantity of production and the health of the employee drops sharply when working hours exceed 60 a week. At J & H, quality and output have risen, and most associates gain five to 10 pounds in the first month at 80 hours.

The basic attitude pervading Jahco is expressed in the designation of these men and women, including officers of the company, as "associates", and the ever present slogan "One For All and All For One".

Every individual in J & H is known only by his first name. All production costs are recorded in each department roughly, by dividing the number of pieces produced and accepted, by the man-hours consumed. Since there are no time clocks, the associates take care of all late comers themselves. The din of banging tools and cat-calls is so unnerving when a worker reports tardy, that he seldom offends again.

This simple device of letting workers handle the absenteeism problem is so effective that three-tenths of one per cent absence in a department proves extremely high.

Production and attendance records are posted in every department. When an "associate" is absent without reason, the Union steward goes over the case and warns him. Repeated offenses bring a recommendation from the steward that the man be fired. This relieves the management of further disciplinary action.

QUALITY WORK REDUCES INSPECTION

Production schedules are posted in every department daily and the board is cleared by each shift before quitting. There are no minimum or maximum requirements for the individual, but the worker who refuses to keep up the pace is invariably singled out by fellow workers. If he is unfit for the particular job on which he is slow, the workers suggest the management shift him to another type of work. The quality of work is so high that the government has discontinued 40 per cent of its inspection and now maintains only final inspection on major assemblies.

Workers are paid on a merit system basis, with a minimum and maximum hourly rate, the wage received depending entirely upon the recommendation of the supervisor in charge of the particular department. There is no profit sharing system, but the associates know that they will be rewarded if production schedules are met and the company makes a profit.

Thus, in the final analysis, the success of this plan lies in the fact that more pieces are turned out per man, per machine, per hour. What is said

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(Concluded from preceding page)

to be a higher level of production than in any comparable metal working plant results in lower cost per piece, lowered costs to the consumer—in this case the U. S. Government—and higher profits for the company.

Whether the Jahco system is practical and pays off for everyone involved is reflected in operating figures which Jack offered. On upwards of $19,000,000 of business last year, the company made $8,000,000, of which $6,000,000 was paid back to the government in taxes. Of the remainder, $1,500,000 was set up as a post-war adjustment fund to provide every employee with wages for six months on the basis of 40 hours weekly while retooling of the plants for peacetime production is under way; and $500,000 was set aside for repairs and machine replacements, and for a school to train armed personnel in the use of J & H war products without cost to the government.

The employee relations work, to which the company credits this singular production record, costs about $75. a month per associate. Jack admits that they have made mistakes, that some innovations failed to contribute to the result desired—namely an employee mentally and physically capable of producing 98 per cent of his maximum ability. When a portion of the employee relations program fails to pay its way it is discontinued. The reason is always explained to the associates, and no attempt is made to hide the fact that the program is designed to achieve greater production and higher profits.

Pin-up girls help morale

The pictures above this Cincinnati grinder are not unusual in Jack & Heintz plants.

Whether the Jahco plan could be applied successfully to a company obliged to pay dividends to large numbers of stockholders is yet unproved. Whether it will work in competitive peacetime manufacture awaits an answer.

Bill Jack's answer to our last question was emphatic. "Yes!" he said, "We're counting the hours until peace comes. Then, in eight hours, our boys will outproduce and undersell any competition they have."

THE END.

A Steel Knot
ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.
BUY WAR BONDS
SPEED CASE STEEL
A LOW CARBON OPEN HEARTH PRODUCT
ONE Steel that gives you .
1. High Speed Machining
2. Greatly Increased Tool Life
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4. High Physical Properties
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8. Great Core Toughness
9. Reduced Carburizing Time
10. Unusual Ductility
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OUR METALLURGISTS ARE AT YOUR SERVICE
SPEED CASE STEEL makes your tools last longer . . . gives you smooth finished parts and—machines from 225 to 275 S.F.P.M.
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TRADE MARKS REGISTERED U. S. PAT. OFFICE

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"C" Tools contain Common Quality Diamonds. Price $12.00 per carat. (Weight stamped on tools)
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"S" Tools contain Select Quality Diamonds. Price $48.00 per carat. (Weight stamped on tools)

Any NIB Tool is obtainable with short shank (⅛" long) by adding "X" to letter designation

Minimum price of $5.00 is charged for small fractional carat tools. All prices are net.

All DTCo Tools are LOC-KEY-SET

Etching Pencil Diamond No. 1-S-PD—⅛x6

No. 12-MV—⅛-⅝ Top View Side View

Detail View

RE-SET-ABLE LOC-KEY-SET

— CHISEL TOOLS

No. 22-CNX ⅛-⅜

Angle-Set 30° ⅛ Shank

30° Angle-Set (Trademark) $10.00 Extra To fit all DTCo "X" Nibs

12° Angle-Set (Trademark) $10.00 Extra

No. 2-MYE ⅛x3 — No. 4-MYR ⅜x3 — No. 5-MYJ ⅛x3 Top View — No. 6-MY—⅛x3 Side View

Detail View

RE-SET-ABLE LOC-KEY-SET

No. 6-C-PG .005x6

No. 3-C-VGT ⅛x2½ 24 S.A.T.

No. 4-C-VG ⅛x3 24 T.P.I.

No. 4-C-EVG ⅛x3 20 T.P.I.

No. 6-C-VGB ⅛x3½ 20 T.P.I.

No. 6-MCG No. 8-SCG ⅛x3½ 0 0 0 20 T.P.I.

No. 1-SGP ⅛x1 Round Tip Gauge Point 28 T.P.I.

No. 3-CTG ⅛x3½ 24 T.P.I.

No. 2-C-EV No. 2-M-EV No. 2-S-EV ⅛x1½

No. 4-CU No. 6-CU No. 8-CU No. 12-CU ⅛x3

No. 10-C-EV ⅛x6

No. 6-CUP No. 8-CUP No. 10-CUP No. 12-CUP ⅛x1½

No. 8-CUB No. 12-CUB No. 16-CUB No. 20-CUB ⅛x2

No. 6-CT No. 8-CT No. 10-CT No. 12-CT ⅛x5

No. 6-CDT No. 8-CDT No. 10-CDT ⅛x7

No. 8-CH No. 12-CH No. 16-CH No. 18-CH ⅛x7

No. 4-CK No. 6-CK No. 8-CK No. 10-CK No. 12-CK No. 14-CK No. 16-CK No. 18-CK ⅛x3

No. 12-CF No. 20-CF No. 32-CF ⅛x5

Side-Center-Set No. 6-M—SCS No. 6-S—SCS No. 10-M—SCS No. 10-S—SCS ⅛x2

Side-Set No. 1-SBR ⅛-⅛ No. 1-SBL ⅛-⅛

No. 1-DS ⅛-⅛

No. 1-ES ⅛-⅛

No. 1-DES ⅛-⅛

No. 1-S-JU ⅛x1

No. 2-SR No. 4-SR No. 6-SR ⅛x2

No. 1-S-ER No. 2-S-ER ⅛x3

No. 2-BS ⅛x2

No. 1-SOC ⅛-⅛

No. 1-SD No. 2-SD ⅛-⅛

No. 8-CNH No. 10-CNH No. 12-CNH ⅛-⅜ Hex.

No. 6-M-IX No. 6-S-IX ⅛-⅜ Hex

No. 6-CZ—⅛-⅛

No. 8-CL—⅛-⅜ No. 10-CL—⅛-½ No. 20-CL—⅛-⅝

No. 32-CL No. 36-CL No. 40-CL No. 48-CL No. 64-CL No. 88-CL No. 120-CL ⅛-⅜

No. 10-CE No. 12-CE ⅜-½

No. 64-CN No. 88-CN No. 120-CN ⅛-⅜

No. 40-CN No. 48-CN ⅛-⅜

No. 18-CN No. 24-CN No. 32-CN ⅛-⅜

No. 6-CL—⅛-⅛

No. 4-CL—⅛-⅛

No. 2-CL—⅛-⅜

No. 6-CN No. 8-CN No. 10-CN No. 12-CN ⅛-⅜

⅛x10 Adaptor—Straight Hole ⅛ or ⅜ as specified 1" deep to hold "Angle-Set" 12" or 30" Also made 1"x10 and 1½"x10 with 12" Angle Hole ⅛" diam. 1" deep. Complete with lock screw and CNX Nib—$40.00

RESETABLE LOC-KEY-SET RE-Setting $1.00 each tool. Mailing envelopes Free to Victory Plants, Grinders' instruction card free.

Diamond Hand Tool No. 10-CHT No. 12-CHT No. 16-CHT No. 24-CHT ⅛x11 (0A)

Special Heavy Duty Size No. 48-CHT—⅛x11 (0A)

DTCo DIAMOND DUST
6 Grades of Fineness
No. 1—Coarse
No. 2
No. 3
No. 4
No. 5
No. 6—Finest
Used for Lapping and Polishing $4.00 per Carat in 10 carat containers

"Angle-Set-Magnet-Block" 2½x3x3 Three units—Block, 12" "Angle-Set" and BIG-HED-N1B with No. 10-CNX Diamond Special—$25.00 Complete

INSTRUCTIONS FOR ORDERING: Number of each tool pictured is eight times the diamond size contained in tool, and is two times the diameter of grinding wheel each tool is suited for. Example—For ½ carat number of tool is 4, and it is suitable for 2-inch wheel; for 3 carats number is 24, suitable for 12-inch wheel. NOTE: Above recommended sizes are for heavy production and include an added 50% safety allowance. For light work add ½ diameter to recommended wheel size. Diamond weights are stamped on all tools where space permits. Form Tool Diamonds: Special tools made from customers' prints and specifications.

Patents Pending. Copyright 1943 Diamond Tool Company, not inc. Chicago, Ill.

A. S. T. E. PLANS OCTOBER MEETING

More Production at Less Cost is Technical Theme

DEDICATED to the task of raising war production output to new highs during the critical months ahead, the American Society of Tool Engineers will convene in Indianapolis next month for its semi-annual meeting.

At technical sessions to be held in the Indiana city October 10, 11 and 12, members of the society will participate in discussions of production problems and new manufacturing techniques important in the mass manufacture of war materiel. While tool engineers recognize their current responsibility for increasing the war output, they are conscious also that the nation's post-war economy may well depend on the eventual application of war-born materials and production methods to peacetime manufacture.

TECHNICAL SPEAKERS ANNOUNCED

In five separate sessions, to be held the last two days of the conclave, tool engineers will hear recognized authorities on such subjects as heat-treating, materials handling, plant layout, gearing, and tooling for inexperienced operators.

Selected as the semi-annual convention city by the society's board of directors at their Springfield meeting last year, Indianapolis is ideal as a convention city. Known as the "crossroads of the nation", it is accessible by overnight travel to a large portion of the membership and provides ample convention facilities and hotel accommodations.

Speaking for the Executive Committee of the Society and the Convention Committee of the Indianapolis Chapter, Adrian Potter, national executive secretary, is urging members to make immediate arrangements for transportation and hotel reservations.

Convention activities will center in the Lincoln and Claypool Hotels. Members, in requesting reservations at either hotel, Potter said, should mention the fact that they are attending the A.S.T.E. gathering.

At the first technical session, Monday, October 11, new techniques and developments in the field of heat treating will be discussed. G. P. Berlien, Lindberg Steel Treating Company, Chicago, and Dr. H. B. Osborn, Ohio Crankshaft, Cleveland, are the feature speakers scheduled for this meeting.

The significance of materials handling and plant layout in expediting war production will be studied Monday afternoon. Speakers will be Randolph W. Mallick, section engineer, Westinghouse Electric and Manufacturing Company, East Pittsburgh; Ezra W. Clark, vice-president and general manager, Clark Trucktractor Company, Battle Creek, Mich.; and E. J. Burnell, vice-president, Link-Belt Company, Chicago. Andrew E. Rylander, technical editor of **The Tool Engineer** Magazine, will serve as chairman of the session.

On the following day, tool engineers will hear discussions of recent developments in gearing. Among the speakers at this session will be Charles F. Phfeffer, production engineer, Wright Aeronautical Corporation, Paterson, New Jersey, who will review the methods utilized by his firm in aircraft engine gear design and manufacture.

At sessions to be held Tuesday afternoon and evening, tooling for inexperienced operators, and aircraft engine surface finishes and gear manufacturing will be studied.

At the tooling meeting, F. T. Harrington, vice-president, Vickers Incorporated, Detroit, will speak.

Dan Gerdan, engine development engineer, and Richard S. Kegg, supervisor, gear laboratory, will discuss surface finishes and gear manufacture respectively. Both men are from the Allison Division, General Motors Corporation, Indianapolis. THE END

Indianapolis meeting will be "strictly business" says President Ray H. Morris

"Long-recognized as effective contributors to the efficient production of materials with which the present war is being fought on all fronts, Tool Engineers everywhere are looking forward to the semi-annual meeting to be held in Indianapolis October 10, 11 and 12.

"*Strictly business* might well be the theme of these sessions. With the exception of the Board of Directors meeting on Sunday and the semi-annual dinner scheduled for Monday evening, the whole time will be devoted to discussions of new ways to hasten production of more and better material at less cost.

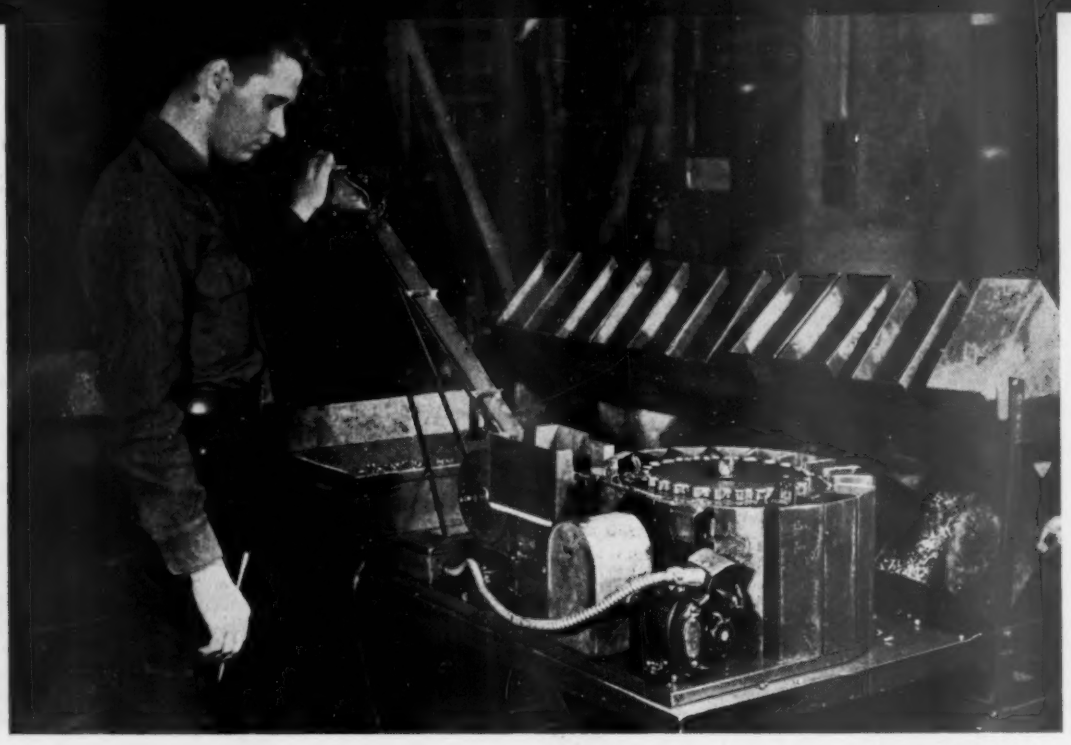
"The program of Technical Sessions has been carefully prepared under the direction of the National Executive Committee by vice president D. D. Burnside and includes subjects of vital importance to be presented by men of outstanding ability and accomplishments in their respective fields.

"It is felt that the 1943 Semi-annual Meeting of the American Society of Tool Engineers will be another milestone in the progress of the Society toward its goal of becoming most dynamic and effective in the field of production."

● *Though the A.S.T.E. Indianapolis meeting has been planned to reduce transportation and hotel requirements to a minimum, war-time travel conditions will pose problems. The Convention Committee advises members to make definite arrangements immediately.*

● Ten new Regional Directors of the A.S.T.E have been elected by the Society's membership, National Secretary Earl V. Johnson, has announced. These men, who were selected in balloting completed August 15, will take office formally at the Semi-Annual Meeting in Indianapolis next month. Each will be notified of his election on or before September 15, Mr. Johnson said.

The new directors are: Region One, Wm. W. Young, Boston; Region Two, Frank W. Curtis, Springfield; Region Four, Thomas P. Orchard, Greater New York; Region Five, H. D. Mozeen, Syracuse; Region Seven, Hallet D. Jones, York, Central Pennsylvania; Region Eight, Wm. J. Gamble, Buffalo-Niagara Frontier; Region Nine, A. M. Schmidt, Toledo; Region 11, H. E. Goodfellow, Grand Rapids, Western Michigan; Region 14, Lawrence .J Radermacher, Milwaukee; Region 15, Carl A. Holmer, Peoria.



Glenn L. Martin photos

Baltimore's famous plane builder has designed special machines for salvage work

Here is part of a battery of Martin-designed rivet-sorting machines. This device sorts jumbled-up rivets by length; others sort them by size and shape.

Scrap Control at Glenn L. Martin

EVERYONE from janitors to executives wage a continual battle on wastage of materials and man hours, in the sprawling aircraft shops of the Glenn L. Martin Company.

Correlated by a small group of experts who devote their entire energies to the task, scrap control has been outstandingly successful in the Baltimore plants of this famous airplane builder. And from it nothing is safe — a small rivet hidden in rubbish, or a 90-inch spar cap worth several hundred dollars and rejected for being .2- inch undersize. Needless to say, all coolant oil clinging to aluminum turnings is recovered for re-use. Secret of the success of the Martin program lies in the fact that everybody's in it, and it never ends.

Such an all-inclusive campaign has to be strategically organized, and have its ends and objectives always in view. Here is the over-all picture.

HIGHLIGHTS OF SALVAGE PROGRAM

Modern bombers are incredibly complicated and must be turned out at an unprecedented speed. Small parts — rivets, nuts, bolts, screws, washers, clamps and so on — are dropped on the floor. Make it a rule that not a nut or a rivet drops on the floor and you slow production. Or have the worker who dropped it pick it up and you do more than cripple your speed of production: you paralyze it.

Item One: in the Martin salvage-and-scrap drive the salvaging of floor sweepings is important. It returns to production tons of small parts each month.

Item Two: in stamping, shearing and machining operations, roughly a third of the aluminum ends up on the floor. It is the salvage-and-scrap program that makes its sojourn there temporary, steers it back into its job of becoming part of a bomber.

Item Three: modern bombers are as intricate as Swiss watches. In the speed of production things happen to intricate parts that cause inspectors to reject them. Sometimes mismachining; sometimes too rough handling by green hands; most often a sudden change in specification. In the Martin program such rejected parts, containing hundreds of man hours of labor and vital materials, are not immediately assigned to the scrap heap.

Further, the program extends to other phases of plant operation: perishable cutting tools; rubber mats mashed in hydropresses; landing-gear tires damaged in installation; even cardboard cartons in which subcontracted parts arrive. This salvage-and-scrap drive gets them back on the job in one way or another.

Turnings are carefully sorted

Aluminum turnings are run through a centrifugal separator to recover coolant.

SIFTING THE FLOOR SWEEPINGS

Sifting and sorting of floor sweepings has been turned into a science at Martin's. Large metal barrels marked "Floor Sweepings Only" stand in factory areas where small parts usually are dropped. Near the top of each barrel is a removable sieve, into which janitors, the shock troops of this part of the campaign, shovel floor sweepings. Through the sieve into the barrel drop rivets and small bolts, nuts, screws and washers. On top of the sieve remain waste paper, rags and other odds and ends.

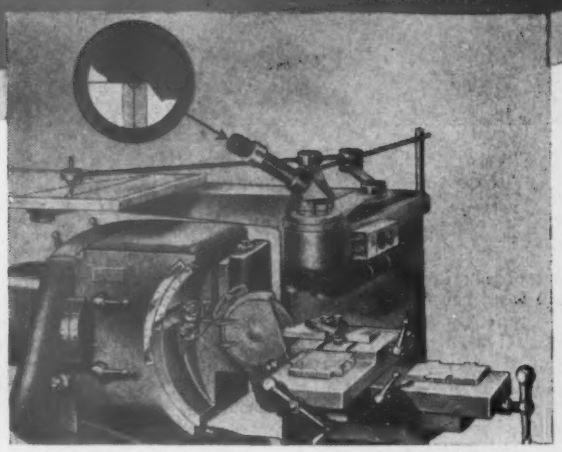
Janitors clear off this top layer, disclosing a second layer of large aluminum and steel bolts, cleco clamps, lock washers, stop nuts, parker screws, wing nuts, and fixture locating pins.

Janitors drop these parts into a can attached to the lip of the barrel and marked "Salvage Box". Members of the department in which the can is located periodically go through this small salvage box, remove parts peculiar to their department, and return the undamaged parts to their own stockroom. Thus parts for which there is only localized use are saved a long trip to the

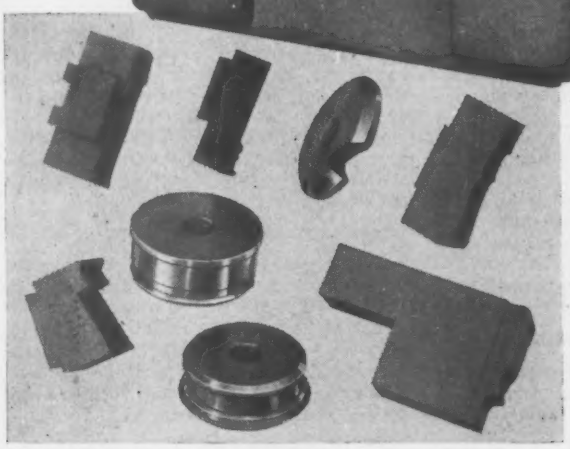
*(*Editor's note*: Because the war can be lost on the industrial front by failure of the industrial salvage campaign, THE TOOL ENGINEER presents here its third study of practical scrap control in outstanding war industries.)*

The SHEFFIELD MICRO-FORM GRINDER

With Pantograph and Microscope



Operator feeds grinding wheel toward point marked by cross hairs.



Typical flat and circular form tools possible to produce on Micro-Form Grinder.

FINISH GRINDS PROFILES DIRECT FROM DRAWING

No Templates Nor Masters

- Grinds both circular and flat form tools, templates, profile gages, cams, dies, etc. to accuracy of .0003".
- Especially suited for grinding cemented carbides and hardened steel.
- Grinding time, especially on intricate profiles, reduced as much as 50-75% compared to other methods.
- Not limited by regularity nor irregularity of work, nor by straight lines, angles or curves.
- Can be used reversely for making layouts from parts having unknown profiles, and for checking parts against layout drawings.

WRITE FOR FULL DETAILS • BULLETIN M-120-143

ARMY E NAVY

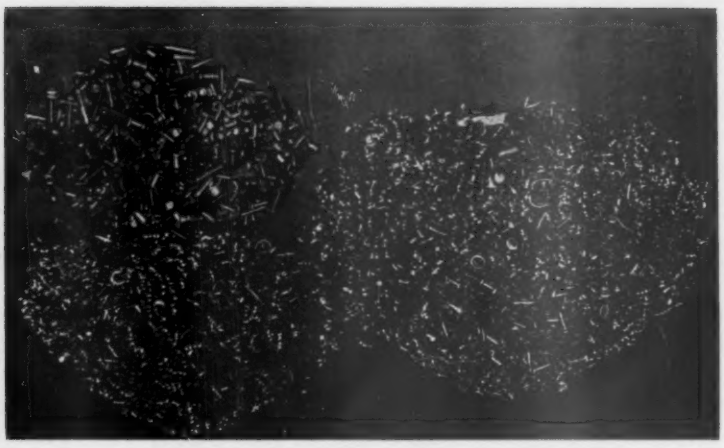
SHEFFIELD MASTER CRAFTSMEN

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS—GAGES—MEASURING INSTRUMENTS—CONTRACT SERVICES

Floor sweepings are salvaged
All floor-sweepings are run through a special rotary sifter to recover usable materials.



Gleanings from the Martin Rotary sifter
Floor-sweepings break into a mass of usable rivets, small nuts and screws, bolts, cleco clamps and parts.

control sorting location, from which they would return to their particular department by a long, time-consuming route. The other larger parts are dispatched forty or fifty pounds at a time, to the central sorting department, where the contents of the larger barrels also come.

THE METHODS OF SORTING USED

In one such department in each plant takes place the job of sorting tons of small parts as to type, material and size. Some of this is done by machines; much of it must be done patiently by hand. In either case it is worth effort for small parts are a bottleneck in plane-building.

Here is the process of the job of unscrambling: By means of a magnetic separator, check up by visual picking, steel, dural and aluminum parts are separated. Then by hand such parts are segregated as bolts, screws, parker screws, wing nuts, castallated nuts, cleco clamps, small special fittings, and rivets. By hand such parts — exclusive of rivets — are further separated by size and material; in the course of the process they are put through a degreaser, and if necessary, replated. As enough of each type and size accumulates, they are dispatched to stock rooms.

RIVETS DEGREASED AND SALVAGED

Meanwhile, hampers of miscellaneous rivets are separated by type, length, shape of heads. This is done by a battery of rivet-sorting machines designed and built in the Martin plant. Like the other small parts, the rivets pass through a degreaser and are placed in 10-pound bags clearly identified and returned to the stockrooms. Tons of them return by this route to production each month.

This is not the end of salvaging floor sweepings, for the dirt and the dust accumulated with the parts is sent to a shop that filters the dirt to recover small bits of metal.

In the meantime, from machines in other parts of the factory, clippings, blankings, punchings, shearings, turnings, and borings are dropping on to the floor. The workmen running the machines, schooled by the factory's conservation department, regard this scrap with two alternatives in mind. Can the metal be used again in the factory, or should it be shipped outside for reprocessing into new raw stock.

There are eight major types of aluminum alloy used in the building of aircraft. One cannot be replaced by another; nor can aluminum in which two types are mixed be of much use. Aluminum off-falls they therefore keep carefully separated by type; the same care is exercised on magnesium off-falls or those of the four types of steel. If the schedule for a man's machine calls for him to switch types of metals, he first cleans up the off-falls from one job before starting another.

PRODUCTION PLANNING HELPS

If the shearings, punchings and blankings are large enough for the making of small clips, gussets, washers and so forth, the workman sets them aside by alloy, gauge and size. They go back to the stockrooms, where they are kept on separate racks. Production Planning watches these racks and the work planned for the Sheet Metal Department. If off-fall material can be used for a job, it is used; this saves each month thousands of full sheets of aluminum alloy for use in the fabrication of skins, cowlings and other large parts.

Pieces too small to be used here are shipped off, still segregated according to type, to be turned back into full sheets. Many such pieces upon which pupils may practice are first loaned to Government training schools.

TURNINGS AND BORINGS SEGREGATED

Turnings and borings are also kept segregated, one type from another. They go off, as small odds and ends, to be reprocessed, but not till they have been through a centrifugal separator and the coolant oil recovered.

The metals concerned in the process mentioned above are chiefly aluminum, some magnesium and some steel. Very little copper, bronze, brass or zinc are worked in Martin factories; however, all damaged parts made of those metals are either reworked for other use or sent off carefully segregated to scrap dealers. Lead, chiefly used in the Drop Hammer Department, is carefully hoarded. Dies removed from use are saved for re-melting into new dies; "risers" are saved for re-melting. Steel drills that have been broken usually are reworked to smaller size, and if that is not possible, the steel goes on to be segregated into various types of scrap.

Raw materials other than metals are salvaged at Glenn L. Martin. Odds and ends of rubber created in making one part are used in making smaller parts; that which cannot be used is sent for reprocessing. With it go rubber mats mashed up in the hydropresses, as well as the heads of mallets and hammers.

ENGINEERING AND SALVAGE

At the same time a more unusual phase of the salvage campaign is in progress. A small group of engineers and inspectors, working together, do this part of the job.

Here are examples:

A sudden change in specifications left a large forging worth hundreds of dollars too short by approximately three inches. This team did some figuring. They found it possible to put machined-up sideplates on each end, machine the part next to it oversize, and obtain a perfect fit.

A large stringer, a 17-foot Z section extrusion 4.5-inches deep with lips on the flanges, was found by a Martin inspector to be a few tenths short. If shipped as scrap, hours of workmanship would be lost: its total value would be the weight of the metal — 25 pounds at 70 cents a pound.

MATERIAL CONSERVATION THROUGH DESIGN

The salvage-engineering team went to work on the problem, pulled out files they have made up which show just about all the uses to which such a part may be put. They found such a piece, a few inches shorter, could be used as a skirt on a main bulkhead frame. They ordered the piece shortened.

Sometimes this team salvages single pieces; sometimes whole baskets or skids full of such pieces. Nothing that can be re-used escapes this group. Once a quantity of .1875-inch bushings came in cadmium plated. Cadmium plating had not been specified, and they seemed headed for the scrap pile. The team had the cadmium stripped off, found the parts still correct as to size, and had them cleaned and returned to use. Incidentally, they saved the cadmium.

That is a picture of the salvage-and-scrap war going on around the clock during the building of Martin fighting planes. It means tons of precious materials and thousands of hours of skilled labor saved from waste in the heat of production.

THE END.

Honing

helped change the "Horseless Carriage" Into AUTOMOTIVE TRANSPORTATION

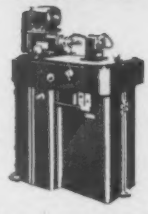
Yesterday—The horseless carriage and its immediate successors proved that a "newfangled contraption" could become an everyday useful device. Its early success could not have been possible without grinding—the first controlled abrading process.

Today—The beautiful sturdy automobile is a marvel of mechanical development and efficiency. It can be well made in millions where its predecessor was poorly made in hundreds. HONING, which provides further control of abrading action, made it possible to make this refined mechanical job in huge quantity.

Tomorrow—Nobody knows what mechanical devices may suit the public need, or catch the public fancy, tomorrow. Postwar planning is not yet definite. But as today's equipment came from yesterday's developments, so tomorrow's will derive from today's. Most of the things we will use tomorrow are already developed.

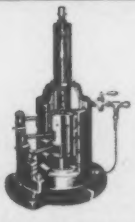
One thing is certain—mechanical devices used tomorrow will demand better control of machining methods.

And Micromatic has been developing hone abrading controls to be ready for that demand.

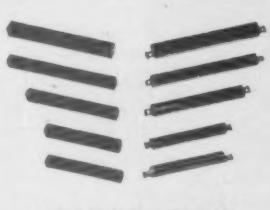


HONING MACHINES

HONING TOOLS



HONING FIXTURES



ABRASIVE STICKS

Micromatic HONE CORPORATION

Detroit, Michigan

MAKERS OF HONING MACHINE TOOLS

MACHINE TOOLS

. . . news and trends in the Machine Tool Industry . . .

Industry Outlook: Orders Fall Off; Conversion of Facilities Commences

The machine tool industry, first to feel the impetus of defense and war production demands, has become the first to suffer from a sharp decline in war boom business.

Both shipments and new orders for the month of June dropped sharply, and reports from the industry indicate that a still lower volume of production and orders was recorded in July. War Production Board figures show shipments in June totaled $108,689,000, a drop of five per cent from the May total of $113,859,000.

The actual trend in machine tool activity, however, was better reflected in the 21 per cent slump in June orders, which totaled only $38,322,000. On the basis of scattered reports gathered during August, orders for July appear to have dropped to approximately $31,000,000 after cancellations.

Tell Berna on the Job

● Tell Berna, general manager of the National Machine Tool Builders Association, is on the job and will remain on the job. A newspaper in Cleveland, headquarters city of the Association, was first to report that he might resign his position. Mr. Berna has denied emphatically the statement. "Machine Tools and Post War" was the title of a feature article contributed by Mr. Berna to the July, 1943, issue of THE TOOL ENGINEER.

The accumulated backlog of unfilled machine tool orders stood at $511,478,000 at the end of June. At the present rate of output, this backlog should be cleared away in little more than four months.

Conversion: Throwing itself wholeheartedly into the struggle to properly equip the nation's war production plants, the machine tool industry last year turned out a record $1,300,000,000 in machine tools. This was approximately seven times the industry's 1939 output.

Now, with the tooling of American war plants virtually completed, and much of the Lend Lease requirements of United Nations filled, the industry has hit a toboggan which indicates machinery production for 1944 far below annual pre-war levels.

Disregarding the possibility of radical changes in war production, necessitating new types of machinery, the industry must convert to other production to insure its existence for the duration. Continued demands from Great Britain and Russia are not foreseen and machine tool builders have been told that most of the possible orders from those two consumers now are on hand.

Though screening of orders by the WPB was designed to prevent the wanton waste of machine tools, numerous builders definitely know that orders could be taken for certain types of machines badly needed, but the government will not approve them on the assumption that the same type of machines can be shifted from other plants where production has slowed or requirements have changed. These builders point out that the government's plan for shifting unused equipment is not working out so well, and the cost of new machines could be amortized quickly and badly needed materiel could be turned out weeks sooner if they were allowed to produce the needed machines.

●

But, all factors considered, the war boom market appears to have been squeezed dry. Builders must find other work, and government procurement agencies would like to utilize certain of their skills and productive facilities. Salvation of the large builders, the majority of them admit, lies in rapid conversion to straight war production. One of the largest builders already has undertaken 20 sub-contracts.

Renegotiation: Representing a large and important segment of the industry, members of the National Machine Tool Builders Association are now wrestling with the problem of more favorable re-adjustment of renegotiation.

Failure of the builders to sway the government from its unsympathetic approach to their case can prove catastrophic from the immediate post-war standpoint. This one issue currently remains the number one problem facing the industry.

Accurate Figures: Before the war imposed government control over the acceptance and filling of machine tool orders, figures on orders and shipments were made available for publication by the National Machine Tool Builders Association. Those figures are now compiled by the Tools Division of the War Production Board.

Today, no publication can print accurate figures on monthly production until the WPB has released them, generally a full month after the period reported. Monthly trends, frequently inaccurate, sometimes are reported on the basis of activities among typical individual builders and dealers. Actually, government screening and shifting of order pools leaves much to be desired from the standpoint of accuracy in such reporting.

Orders and Conversion Discussed at Advisory Committee Meeting

Meeting in Washington last month, the Machine Tool Industry Advisory Committee of the Tools Division, War Production Board, came face to face with the problem of converting unused machine tool capacity to the production of other war material with a minimum expenditure of additional machine and man-hours.

Facts revealed by the WPB at the meeting indicate that production for next year will fall far below that of this year. The currently declining rate of shipments made the Tools Division policy on conversion the major subject of the meeting. WPB policy on the subject was first established May 14, in a letter from the Director of the Division to all machine tool builders.

Next year: No amount of anticipated war production by the industry, it was agreed at the meeting, could be expected to approach the difference between its machine tool production rate in 1944 and its previous maximum rate. The industry's maximum rate of output this year was made possible by a substantial volume of subcontracting and by high production of the items for which the equipment and skills in each plant were best suited.

It was recommended that a sub-committee be appointed to report on estimated levels of activity in the production of machine tools and other war goods by the industry during the coming months. Recommendations, it was expected, would be made with the report.

(Continued on page 201)

Gerard Swope (right), president, General Electric Company, and one of the nation's largest machine tool buyers, with W. G. Robbins, president, Carboloy Company, Inc., G. E. subsidiary.

The men are inspecting the Carboloy-produced cartridge case die which enabled the conversion of cartridge cases from brass to steel to relieve the copper shortage.

A wide Variety of SPECIAL MACHINES

A two-way, cam-operated, automatic machine for reaming inside and threading outside of a rough cast conduit coupling.

Four-station index machine drills and taps main casting for a heavy steam iron.

Seven drilling and milling operations on automotive connecting rods are done on this machine.

Two drilling and one tapping operation are performed on brake piston bodies at 480 per hour.

High-performance index machines for face-milling, threading, and reaming tough steel shell cap.

Oil holes in aircraft engine crankcases are drilled at the rate of 12 complete pieces per hour.

Center-column type machine for drilling, reaming, counterboring, countersinking, and tapping spark plug holes in aircraft engine cylinders.

This machine drills, reams, countersinks both sides, cuts the accurate oil groove, and taps rocket arm for aircraft engines.

Centering machine for gun barrel forgings up to 30" diameter. Hand-operated clamp and feed.

One of several designs of unique high-production machines for complete assembly of needle bearings.

Designed and Built by REHNBERG-JACOBSON

For a good many years we have specialized in the design and manufacture of machines planned to accomplish a particular job. Most of these machines have been relatively simple, but all of them have been extremely effective. In fact, we have preferred to do things the simplest practical way because we believe it leads to greater production efficiency. Many of our machines have consisted, essentially, of special bases and pedestals on which we have mounted suitable combinations of our standard Drill Units and Tap Units to accomplish the desired operations.

TELL US WHAT YOU NEED

With a broad and varied experience in the manufacture of specialized machines, we believe we can help you to solve production problems. Let us consider your conditions and requirements.

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Special Machinery

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Damage from DINGING can be greatly reduced!
Aero Tool Swivel Flush Sets minimize dinging without sacrifice of rivet seating accuracy and smoothness. Rejections are reduced, speed of flush riveting operations greatly increased.
REGARDLESS OF THIS ANGLE—
—THE FACE STAYS FLUSH

Aero Tool SWIVEL FLUSH SETS Are Engineered for Green Hands

When these Sets are placed in the hands of unskilled labor better results are immediately noticeable, due to the broad angle of safety incorporated in their special design. They seat flush regardless of shank angle.

Typical Aero Tool precision design and manufacture are evident in all details of construction. Shank and Bell are of *forged* steel for great structural strength. Perfect fit between Ball and Socket prevents binding, assures perfect swivel action. Mirror-polished Full Crown Face eliminates excessive skin marking.

Cleaning and oiling are quickly done; the retainer collar is easily removed, the unit disassembled and re-assembled in a matter of seconds.

Write for catalog listing these and other Aero Tool Precision Products for better, faster riveting.

BLURPING IS NOT POLITE
...*even for a rivet gun.* Don't "blurp" a pneumatic rivet hammer when the rivet set is not in the gun—it causes immediate damage to piston and set bushing, takes valuable time to repair. Be careful—conserve tools!

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6 FEATURES

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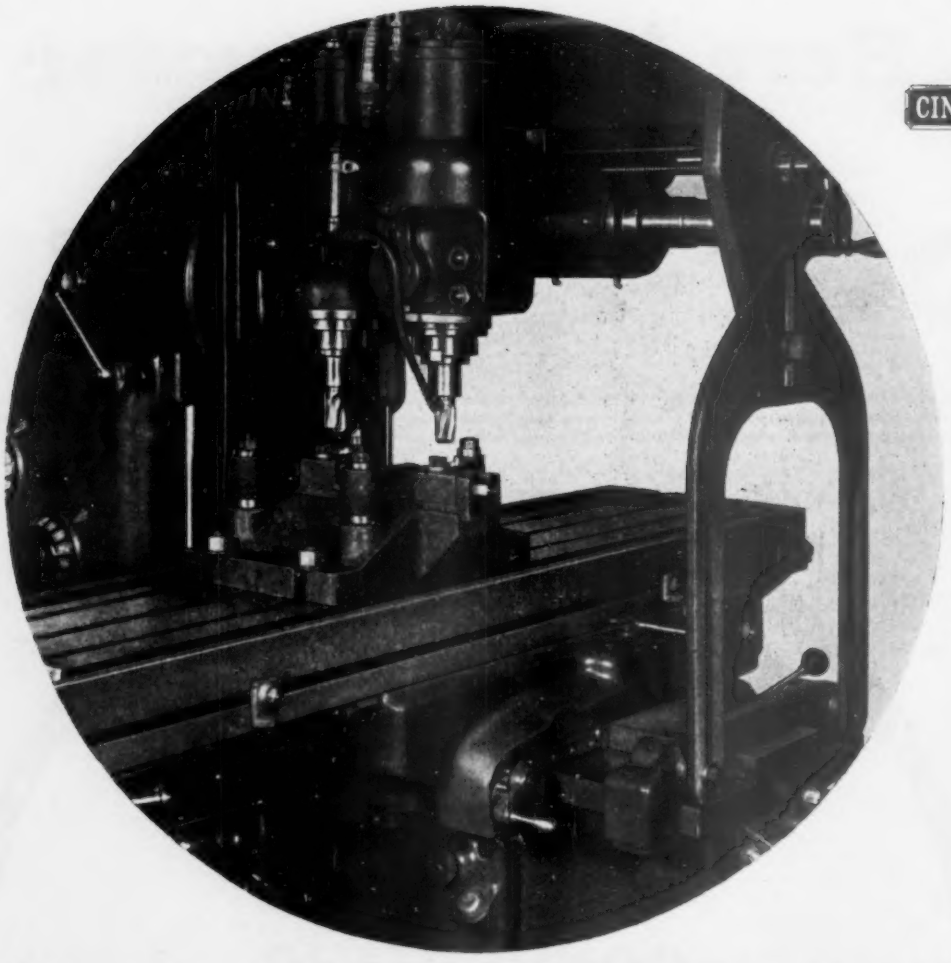


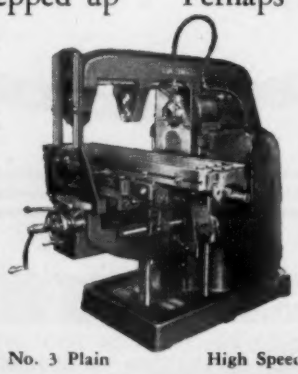
HOW TO INCREASE PRODUCTION

on a Standard General Purpose Miller

The great majority of parts produced in machine shops are manufactured on general purpose machines. Quite naturally, production is usually lower than the output of automatic machines, but it sometimes can be stepped up to the speed of the automatics through the addition of attachments.

An example of this type is illustrated here . . . a CINCINNATI No. 3 Plain Dial Type Miller equipped with a two-spindle vertical attachment. With this equipment, production is **doubled.** It has the further advantage of being removable when the machine is to be used in the conventional manner.

Perhaps there is a better or faster method of handling the milling operations in your shop. Our engineers will be glad to give you their recommendations. Meanwhile, write for a copy of Dial Type Milling Machine Catalog, M-970-1.



Above: CINCINNATI No. 3 Plain High Speed Dial Type Milling Machine

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENING MACHINES

INDUSTRIAL NEWS DIGEST

. . . a review of significant developments and new techniques in mass production industries . . .

GE-Held Sintered Carbide Patents Made Available to U. S. Industry

Thirty-seven patents covering cemented or sintered carbides have been assigned by the General Electric Company to the Government's Alien Property Custodian. The patents are now available for use by American industry on a non-exclusive, royalty-free basis, it has been announced.

Early Work: General Electric, which carried out early development work on carbides in the United States, originally acquired these patents from Fried Krupp Aktiengesellschaft, Germany.

In addition, the Custodian controls 16 other patents on the same products and processes. The cemented carbides covered by these patents are formed by particles of such materials as tungsten carbide, and a metal such as cobalt to bind the particles. Sintered carbides now are used in deep drawing and extrusion dies, wire drawing dies and cutting tools as well as gages and grinder parts. Manufacturers interested in the patents may apply to the Office of Alien Property Custodian, Washington, D. C.

Buffalo to Play Host to Foundry Congress in 1944

Buffalo, New York, will be the scene during the week of April 25, 1944, of the American Foundrymen's Association Third War Production Congress. All phases of the event, to be held in conjunction with the forty-eighth Annual Meeting of the A.F.A., will be housed in Buffalo's Memorial Auditorium. Provision will be made to demonstrate the utility of products in war production and conservation of materials, through use of exhibit booths for displays and models.

Officers Elected: At a recent meeting of the Association's Board of Directors in Chicago, the following officers for the Association's headquarters staff there were elected: R. E. Kennedy, Secretary; C. E. Hoyt, Treasurer; N. F. Hindle, Assistant Secretary; Wm. W. Maloney, Staff Assistant; and J. Reinings, Assistant Treasurer. The office of Executive Vice-President and Secretary were combined, Mr. Kennedy thus becoming the administrative head of A. F. A.

Gray Iron Founders' Society Names Educational Director

The Gray Iron Founders' Society, Cleveland, last month appointed John P. Mullen as educational director of the organization.

Washington Headquarters: The appointment was announced by Edward C. Hoenicke, assistant to the general manager, foundry division, Eaton Manufacturing Company, Detroit, and chairman of the association's publicity committee. Mr. Mullen, it was stated, will establish headquarters in the Society's Washington, D. C. offices.

Industrial Accident Prevention National Safety Congress Theme

The importance of accident prevention among war workers will highlight the National Safety Congress, to be held in Chicago, October 5, 6 and 7.

Last year's Congress started the machinery of a nationwide drive to save manpower by accident prevention. With that campaign in high gear, this year's program is devoted exclusively to accident prevention problems which have a direct bearing on war production.

Highlights: The Congress annually attracts 10,000 safety leaders. This year's plans call for 200 Congress sessions with more than 500 program participants. A Safety Training session will be devoted to a discussion of ways and means of correlating safety with vocational training. Wilfred Sykes, president, Inland Steel Corporation, will address the Metals Section on "Safety for Production for Victory."

(Continued on page 121)

Tooling Time Cut 75 Per Cent

Curtiss-Wright photo

Curtis-Wright's plastic punch and Kirksite die effect savings in sheet metal forming.

● "Highly successful", is the observation of production engineers at Curtiss-Wright's Buffalo Division on the use there of a drop hammer equipped with a new plastic punch and non-critical metal die.

The new type punch and its component Kirksite die, tested on several hundred sheet metal aircraft parts, can be produced with 75 per cent less tooling time than an all metal die, in addition to saving critical materials, the engineers state. The punch material becomes malable when heat-treated and can be shaped to fit the die in one operation. When the die is heated to approximately 370 degrees (F), the plastic punch, roughly shaped for mating contours, is pressed into it to produce an exact match punch without benefit of machining.

Rubber pads are eliminated with the new method, and parts may be formed with fewer blows. Worn punches may be "dressed" by re-heating the Kirksite die and pressing the punch into it.

"GREENIE" T.M. REG. U.S. PAT. OFF. — *Retreat of the Wolf*

WONDER WHAT'S THE MATTER WITH HIM—A MINUTE AGO HE WAS VERY FRIENDLY--- THEN HE GOT PALE AND LEFT IN A HURRY!
MAYBE HE SAW ME COMING--- HE'S MY HUSBAND!
RALPH DAVIS

They don't load Die Sets in BOMB BAYS

Die sets are work-a-day products that stay at home, holding and guiding the dies that stamp out and form plane parts by the millions. We can safely and proudly say that Danly Die Sets have speeded America's air program.

Danly facilities and service have been steadily increased since 1940. One of the major objectives was to be ready for the mass production of planes—that was sure to come—that came—planes that are blasting the way to winning the war.

If you need die sets in any phase of your production call Danly.

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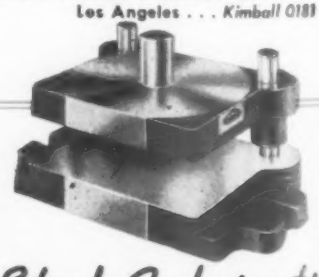


DANLY DIE SETS

Welded Steel Fabrication

INDUSTRIAL NEWS DIGEST

(Continued from page 119)

A "Seeing for Safety" session will cover all phases of vision and visibility. This will not be exclusively a "safety goggles" session, it is said, but will cover physical defects of eyesight, use of color for visibility and other factors in production work. The Woman in Industry session will center around the health and accident problems of feminine production workers. New this year, it was announced, will be an Aircraft Manufacturing Section.

Business Notes from Industry: Purchases, expansions, new services

Spray Painting: Designed to assist industry speed war production through faster, more efficient product finishing, The DeVilbiss Company, Toledo, Ohio, is holding one-week training sessions for industrial spray painting operators.

Open without charge to all applicants using DeVilbiss equipment in their work, the course will be held in Toledo during weeks beginning October 18, and November 15. The course will cover all phases of spray painting in application to industrial finishing with classroom instruction and shop work conducted by spray painting experts, DeVilbiss says.

* *

Price Reductions: Frostrode Products, Detroit, has announced price reductions of 10 to 23 per cent on all models of their portable welding refrigerator units.

* *

Production: Output of aircraft propeller blades during the first six months of 1943 by American Propeller Corporation, subsidiary of the Aviation Corporation, was nearly two and one-half times greater than in the last half of 1942, William F. Wise, executive vice president says.

Three models of the hollow steel type blade manufactured exclusively by American Propeller at Toledo are now in production, he said, compared to the single model being made when the plant was opened in May last year.

* *

Subcontracting: The Baldwin Locomotive Works and its subsidiaries awarded sub-contracts approximating $65,000,000 in the first six months of 1943, it has been announced. This is an increase of 15 per cent over 1942.

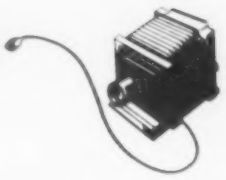
A total of 1,035 sub-contractors located in 28 states and the District of Columbia shared in the Baldwin program of spreading the work. Forty-nine per cent of the sub-contracting plants employed 500 or more persons, 34 per cent employed from 100 to 500, and seven per cent were establishments with less than 100 employees. Proud of its sub-contracting record, the Philadelphia concern anticipates a further increase in its sub-contracting during the later half of this year and early 1943.

* *

Photographic Service: As the microscope aids the scientist in viewing objects too small to see, the high speed camera now enables the engineer to study motion that is too fast to be observed. McLarty Business Films, Buffalo, New York, will now photograph industrial processes at a camera speed of 3,000 negatives per second. On the screen, the high speed motion of a machine or tool is retarded 250 times slow-

(Continued on page 123)

PRODUCTION PIX



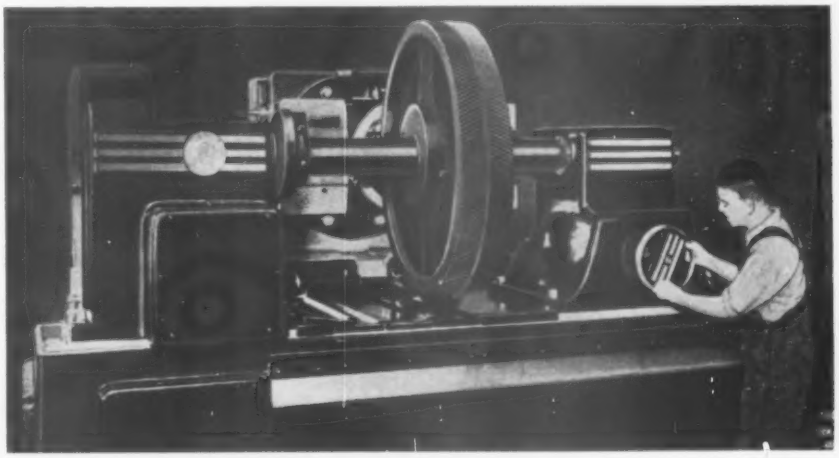
WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING

MORE PICTURES ON PAGE 129

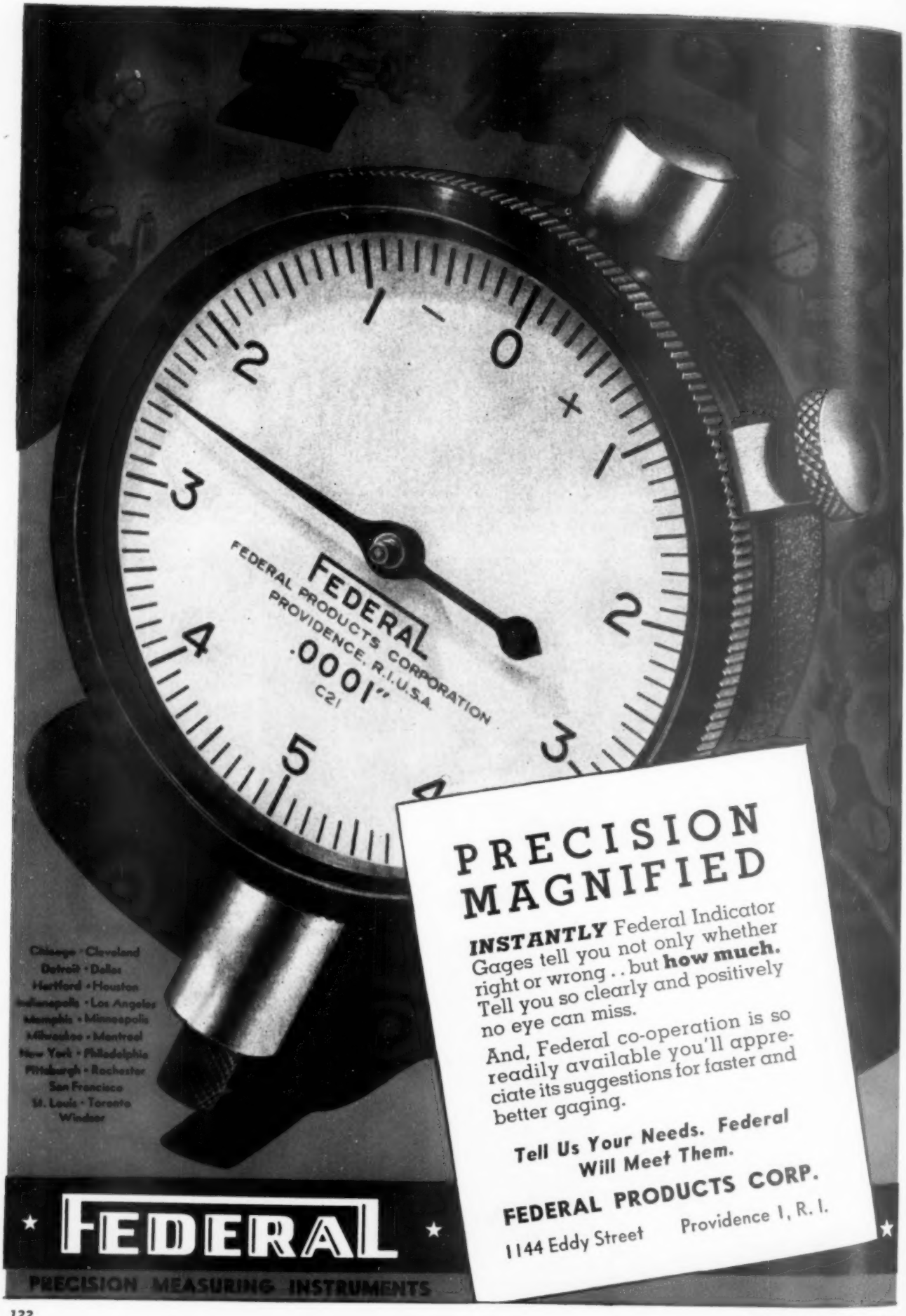
America's emblematic victory symbol formed by machine tools which drill angularly and machine cylinder heads for Pratt & Whitney aircraft engines built by Chevrolet. Three major operations are performed by this battery in the automobile plant.

Overhead conveyors carry cylinder liners for Rolls-Royce aircraft engines through various machining departments in the Packard plant.

Light, portable rapid heating explosive rivet gun developed by the Goodyear Aircraft Corp.



More than 100 sizes and types of gears ranging from four-inch diameter to four-foot diameter and 12-inch face width have been finished in quantity lots on this Michigan rotary crossed-gear finisher at the Falk Corporation, Milwaukee.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INSTANTLY Federal Indicator Gages tell you not only whether right or wrong . . but how much. Tell you so clearly and positively no eye can miss.
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Tell Us Your Needs. Federal Will Meet Them.
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PRECISION MEASURING INSTRUMENTS

INDUSTRIAL NEWS DIGEST

(Continued from page 121)

...er than normal. Subjects already explored with this high-speed cinematography include the behaviour of metals, machines and cutting tools.

* *

Acquisition: Electro Alloys Company, Elyria, Ohio, by American Brake Shoe Company. The Elyria plant will be operated as a subsidiary of the parent organization, it was announced.

* *

Orders Changed: Production plans in New Orleans' booming Higgins Industries were upset last month when the Maritime Commission cancelled its contract for wooden Curtiss C-76 Caravans, and then replaced the cancelled order with a contract for metal Curtiss C-46 Commandos, which the Army has decided are less costly and more efficient than the wooden type.

* *

Purchase: All outstanding stock of the Precision Manufacturing Company, by Miller Tool and Manufacturing Company, Detroit. Precision does business primarily with the aircraft industry, producing special tools, jigs and fixtures as well as handling special types of production work on aircraft parts. Officials of the parent concern say the acquisition will broaden Miller Tools activities, which until now have been largely in the automotive field.

* *

New School: To train men and women for employment with the company, and to enable them to learn skills valuable after the war, the Aro Equipment Corporation, Bryan, Ohio, has opened a technical school. A faculty of eight is offering nine technical courses.

* *

FOREMEN CONVENE BY RADIO

● Defense Transportation Director Joseph B. Eastman has received one startling answer to his plea that travel be reduced to a minimum. The national Association of Foremen has announced that its annual convention will be held over a national radio network this month. The radio convention, only one hour long, may be the briefest in history. Radio speakers will discuss subjects of interest to American industry. Chapters will hold local meetings where they will listen to the broadcast before hearing discussions by local industrial leaders. The plan will enable several thousand members to remain on their war production jobs.

Industrial Engineers Make Award to Sav-Way Industries Head

In recognition of the outstanding contribution he has made to the progress of industrial engineering and to the war effort through the record output of the concern he heads, Tom Saffady, Sav-Way Industries, Detroit, was last month presented the Academy Award of the American Society of Industrial Engineers.

(Continued on following page)

WANTED:

More Tool Shank Problems to Solve!

MAYBE your shop is one of the shrinking number that doesn't yet know about and use Victory Tool Shanks . . . those low cost, long lasting shanks, cast to shape of tough Meehanite, to which you cement your own carbide tips.

Some of the busiest, most exacting plants in the war industries have been using Victory Tool Shanks regularly for many months. These shanks have several distinct advantages over carbon steel and besides, they are not critical —can be furnished promptly, in quantity.

This illustrated catalog, Bulletin 53 T-2, tells the whole story — sizes, shapes, characteristics, prices. Write for your copy today.

THE COOPER-BESSEMER CORPORATION
DEPT. E., MOUNT VERNON, OHIO

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HERE'S HOW

"SUTTONIZING"

RECLAIMS your broken H.S.S. CUTTING TOOLS

BEFORE

6" x 5" x 2" slab mill with teeth fractured.

AFTER

Same slab mill as reclaimed by "SUTTONIZING". Also rough ground.

Here are some typical tools reclaimed by "SUTTONIZING". Fractured teeth can be repaired on the following: shell mills, large size end mills, plain mills, broaches (subject to our approval), side mills (cracked 4" O.D.—low limit), boring, slotting, cut off and turning tools repaired or fabricated.

"SUTTONIZING" has earned and is holding this "top spot" in the welding reclamation of H.S.S. cutting tools. Tough jobs have not slowed down "SUTTONIZING"—but rather have boosted its popularity unbelievably in the year that it has been used for salvaging most all types of difficult to repair H.S.S. cutting tools. Wire or write for our catalog describing the "SUTTONIZING" method.

DELIVERY Immediate attention on critical jobs. Normal returns 10 days.

RECLAMATION by Welding of HIGH SPEED STEEL TOOLS
RENEWAL
CONSERVE TOOL STEELS FOR VICTORY
WELDING EQUIPMENT & SUPPLY CO.

SEND FOR CATALOG TODAY

This catalog shows actual photographs of reclaimed tools.

WELDING EQUIPMENT & SUPPLY CO.
223 Leib Street • DETROIT, MICHIGAN

Why not be Upp and Adam too—by writing today for complete information on "SUTTONIZING", a welding process for the reclamation of broken hi-speed cutting tools? We also have available six different types of Eureka Steel Welding Electrodes for use in your own plant.

WELDING EQUIPMENT & SUPPLY CO.
223 Leib Street
Detroit, Michigan

Gentlemen: Please send me complete information on the "SUTTONIZING" welding process and your complete line of Eureka Electrodes.

Name.....Title.....
Company.....
Address.....
City.....State.....

(Continued from preceding page)

Robert Law Crinnian, president of the society, made the award at ceremonies held in the shops of the Detroit machine tool builder. Attending the presentation were the firm's employees, Army officers and prominent industrial engineers.

Mansfield, Ohio, Electric Appliance Plant Converted

Two-pound chunks of steel were transformed into armor-piercing shot in 80 seconds recently to demonstrate how workers who formerly made electric household appliances are now turning out war materiel. The shot demonstration was viewed during a tour of the Westinghouse Electric Appliance Division plant, Mansfield, Ohio.

The plant has been converted completely to the production of anti-tank shot, aircraft parts, military communications equipment, binoculars and other war products.

Ingenuity: Among the devices being utilized to speed production at the converted plant is a tool which eliminated a drilling operation on shot which previously required 9,300 hours of work annually; another is a specially-tooled automatic screw machine which produces 60 parts so intricate in shape that 23 different dimensions are created and checked for accuracy to seven-tenths of a thousandth of an inch.

Old type moulding machines easily adapted to light-metal alloys

Manufacturers planning to adapt their foundries to the casting of newer magnesium and aluminum alloys may use the same type moulding machines now used for iron and steel, according to R. F. Lincoln, Machine Division, The Osborn Manufacturing Co., Cleveland, Ohio.

Changes: This large manufacturer of moulding machines says that old types can be used for the newer light-weight metals with only minor adjustments.

"Operation of moulding machines employs the same basic principle in producing a mould for a casting as that employed during the last thousand years of casting metals," Lincoln said. "Likewise, the making of moulds for the newer light alloys employs these same basic principles.

"A minor change in the adjustment of the jolt blow to produce the required hardness of the mould is necessary, but that is practically all that must be done."

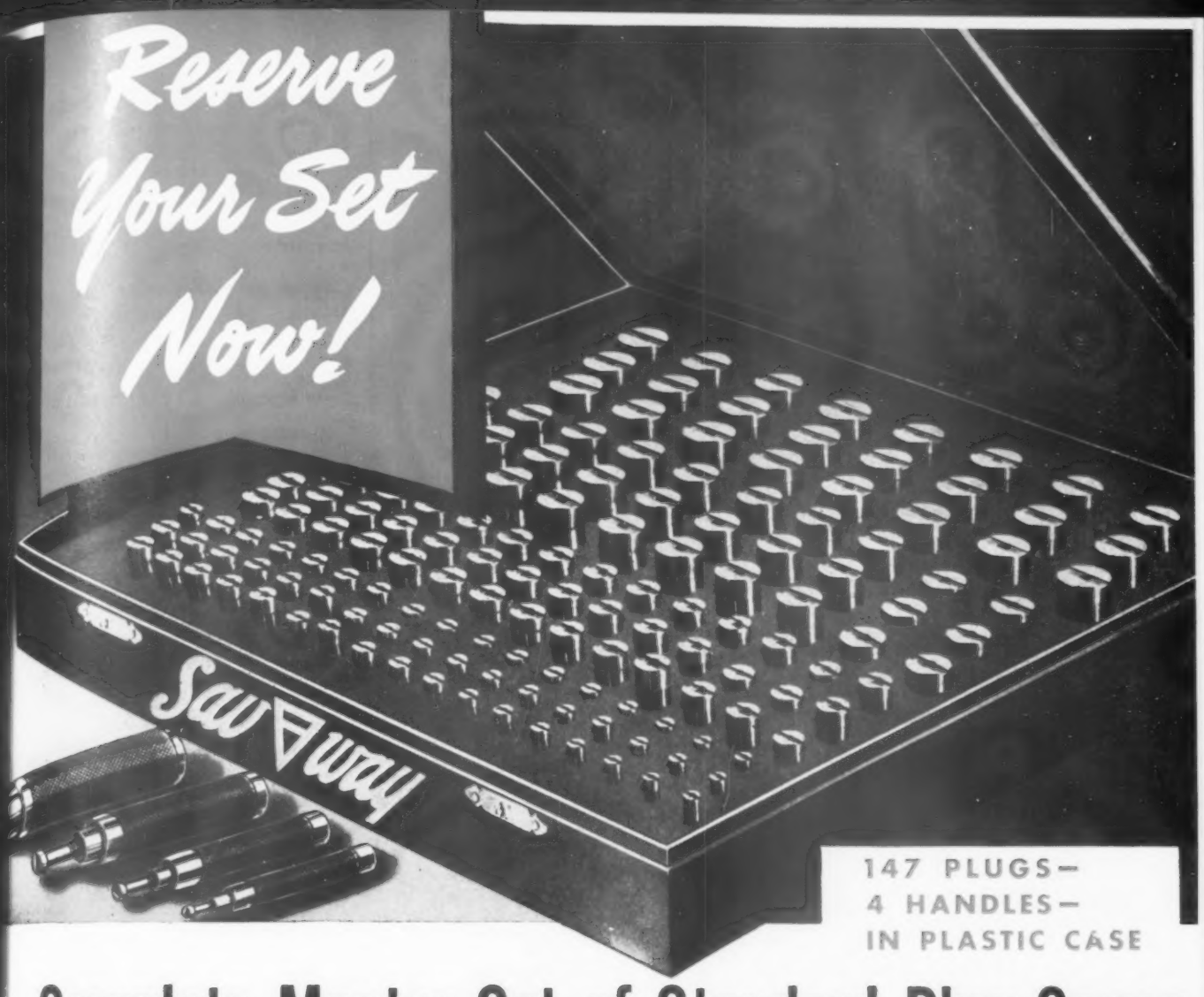
The moulding of aluminum and magnesium alloys does involve special consideration of the type of pattern and a proper type of moulding sand, rammed to the right degree of hardness, he explained. Marked changes have been made in gating the mould and in the pouring technique.

Some foundries have made striking adaptations to the newer techniques, Lincoln said. One manufacturer of cylinder heads for airplane engines has so designed the mould gates that a minimum amount of technique has to be used in pouring. The metal is poured into the sprues and the gates control the flow to the casting.

Although considerable research work

(Continued on page 126)

Reserve Your Set Now!



147 PLUGS—
4 HANDLES—
IN PLASTIC CASE

Complete Master Set of Standard Plug Gages

For the first time—a complete Master Set of standard plug gages for hole inspection, including 147 plugs and 4 handles. Plugs are set in increments of 1/64ths, starting at 1/4" and going to 1". There are three plugs of each nominal size—.0005 over, standard, and .0005 under.

All plugs are deep-frozen before finish grinding to relieve internal strain and provide accelerated aging, and are held to gage makers' (X) tolerance, lap finish.

The plastic case has a transparent cover which presents a clear view of the contents and instantly indicates a missing plug.

Sav-Way Plug Gages are produced by skilled gage makers; they have been proven in actual use on aircraft and ordnance parts of the highest accuracy.

KEEP AN EYE ON

Send Coupon for Detailed Description and Price

SAV-WAY INDUSTRIES
Box 117, Harper Station, Detroit 13, Michigan
Please send descriptive literature covering Sav-Way plug gages.

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Machine Tool Division
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PRODUCERS OF SAV-WAY HAND AND HYDRAULIC INTERNAL GRINDERS · SAV-WAY GOLD SEAL SPINDLES · PLUG GAGES · PRECISION AIRCRAFT AND AUTOMOTIVE PARTS

W-S Standard Lathe Centers with carbide tips. Morse, Brown & Sharpe and Jarno tapers for both TURNING and GRINDING.

SAVE ON SET-UP, ADJUSTING and GRINDING TIME with these more *accurate* W-S Lathe Centers. Their concentricity is *guaranteed* to within .0002" or less! Made by entirely different method of manufacturing, W-S Centers help assure the highest degree of precision work from your machine tools. Genuine CARBOLOY tips (other carbides may be specified) reduce friction and give a cooler, more perfect bearing. The craftsmanship inherent with all W-S Centers goes far beyond the point of visual inspection. However, it is evidenced in their ability to maintain greater accuracy while outlasting from 10 to 60 ordinary centers. Carbide tipped tools are not just a specialty with us . . . we make them *exclusively*. The majority of sizes is available from stock most of the time. Write for FREE Catalog 942-A and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: 1/2 to 1-1/2.

W-S Standard Reamers with Carbide Tips. Tapered and straight shanks. Sizes: 1/4 to 1-1/2.

WENDT-SONIS

CARBOLOY CUTTING TOOLS

CENTERS • DRILLS • CORE DRILLS • COUNTERBORES • SPOT FACERS
END MILLS • REAMERS • HOLLOW MILLS • LATHE BITS • SPECIAL TOOLS

(Continued from page 124)

has been done in the foundry industry to create a technique for the proper casting of new light alloys, a great number of machines that have been in use for 25 years are now adapted to the new metals.

Copper scrap shortage acute; greater collection sought

The United States depends upon scrap as the source for a approximately 40 per cent of its copper. Much of this scrap is usable by remelting and without further refining.

Because the flow of Number One and Two grades is diminishing so rapidly the gap must be filled by other less pure grades which must be refined before they can be used.

Below capacity: Even greater shortages are being felt in these "less pure" grades. These are termed "Refinery Brass" and "Copper-Bearing" Material. In appealing to industry for additional copper, brass and bronze scrap, WPB emphasizes that in December, 1942, scrap refineries received only 4,800 tons of these grades, which was not enough to enable them to operate at even one-fifth of capacity.

To ease the scrap shortage, the Salvage Division, WPB, has appealed to industry to make up a forecast deficit of 625,000 tons of refinery brass and copper-bearing materials in 1943. This amounts to approximately 52,000 tons a month more than the 1,000,000 tons collected last year.

No panacea for industrial lighting problems visualized

Every individual lighting source has characteristics which can be used in the conservation of critical materials, depending upon the plant itself, its use, as well as upon the ingenuity of the lighting engineer.

This conclusion was reached in a survey conducted by the General Technical Committee of the Industrial and Commercial Lighting Section, National Electrical Manufacturers Association. Basis of the survey was a study of the amount of critical materials used in lighting systems developed for typical war production plants.

Conclusion: The committee reports that no single light source or single lighting system can be regarded as a panacea to industrial lighting problems. Nor do the amounts of critical materials involved indicate that a single type of light source can be universally applied for conservation of critical materials.

Each light source, when installed in proper equipment, is a tool of the lighting engineer in providing adequate illumination. (See The TOOL ENGINEER, April 1943.)

Hot finished seamless steel tubes advocated

Substitution of hot-finished for cold drawn seamless steel tubing has been recommended by the Seamless Steel Tube Institute as a means of increasing output of tubing to meet war needs.

Reason: This recommendation covers the larger sizes, with heavier walls, which are so often machined. Generally speaking, this will mean tub-

(Continued on page 129)

Case Studies

SHOWING THE ADVANTAGES OF THE

ELLIPTOID TOOTH FORM

NO. 1

Passenger car gear box equipped with conventional gears weighed 150 pounds for a torque of 300 foot pounds. Using the ELLIPTOID tooth form, this unit was reduced in weight to 76 pounds for the same torque capacity.

NO. 2

In changing from conventional to ELLIPTOID tooth form, the torque capacity of a truck transmission was increased 200 per cent without adding a pound to its weight.

NO. 3

A truck manufacturer who changed his conventional transmission gearing to ELLIPTOID gearing discovered he had added 300 per cent to the service life of his product.

NO. 4

Gear tooth shaving in the ELLIPTOID form has made it possible for a speed reducer manufacturer to materially reduce both the cost and size of his product for any given rating.

Red Ring Shaving machine develops the Elliptoid tooth while shaving and at no extra cost.

NO. 5

Another manufacturer of heavy equipment, having difficulty with tooth breakage, substituted the ELLIPTOID tooth form for the conventional form. Result—three times the service life.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN · DETROIT, MICH.

Here's a Grinding Wheel that Ca
Increase Production on *Many* Job

. . . The NORTON OPEN STRUCTURE Grinding Wheel

THE outstanding feature of Norton Open Structure Grinding Wheels and Segments is of course the large pore spaces that result in a very fast, cool cutting action. This means that No. 12 (open) structure products are especially suitable for jobs that require extra heavy stock removal, or extra coolness of cut or both—such as:

Surface grinding
Hob grinding
Formed tool grinding
Gear grinding
Internal grinding

This Norton open structure wheel is a real production booster on many jobs. But it is just one of several Norton structures available. Let Norton engineers study your grinding jobs and make sure that you are using the most suitable wheels in abrasive and bond, in grain and grade as well as in structure.

NORTON COMPANY

Worcester 6, Mass.

Distributors in All Principal Cities

W-912

NORTON ABRASIVES

(Continued from page 126)

ing of ⅜" O. D. or larger, depending upon the manufacturer.

Every foot of seamless tubing that can be made and shipped in the hot-finished condition represents an extra foot of tubing that can be cold drawn for aircraft or other war equipment requiring such tubing.

Uses for which hot-finished can be used in place of cold drawn include those in which the tubing is machined or in which appearance may be temporarily sacrificed as is being done in the construction of many machine tools.

The Institute maintains an office in the Gulf Building, Pittsburgh and will assist users on making conversions.

Aircraft Manufacturing: New Rivet Setting Process Developed

Bell Aircraft: The Corporation's Ordnance Division, manufacturing more than 20 types of gun mounts and adapters for aircraft and naval use, has been moved from Buffalo, New York, to Burlington, Vermont. Additional space for the expanding production effort of the division resulted in the move, according to Carl F. Lozon, Division Manager.

More than a quarter-million feet of floor space will be available in the converted cotton mill. Key employes will move from the Buffalo area to Burlington by mid-September, it was said, and "several thousand" Vermont workers will be hired.

Bell Ordnance work commenced five years ago when the Company was faced with the problem of mounting flexible .50 caliber machine guns on its planes. Because no gun mount then available would successfully do the job, Bell developed and built its own. The gun mounts and adapters are designed for fighter planes, bombers, flying boats, and surface craft.

* *

Jam Riveting: A new process of setting aircraft rivets which is adaptable to work on difficult parts and is said to cut by 40 per cent the number of two-man riveting teams necessary when applied to production, has been developed by the Buffalo, New York, aircraft manufacturing plants of the Curtiss-Wright Corporation.

Called "jam riveting", the new process is Curtiss-Wright's second major riveting development offered the American aviation industry to save time and materials in war production.

The new development, which eliminates the "bucker" of the two man team, as did the "gang squeezer" developed by the Corporation earlier, combines flexibility and speed in driving rivets. The "gang squeezer" method was adopted by every large plane plant in the United States. Besides increasing output, the new method insures more uniform quality of work with less rejections and salvage, according to Curtiss-Wright production men.

The new tool consists of a regular vibrator with added attachments so that its action is automatically controlled by the "travel" of the driving set. It was designed to work on curved cowling and specialized parts where gang or individual "squeezers" cannot operate.

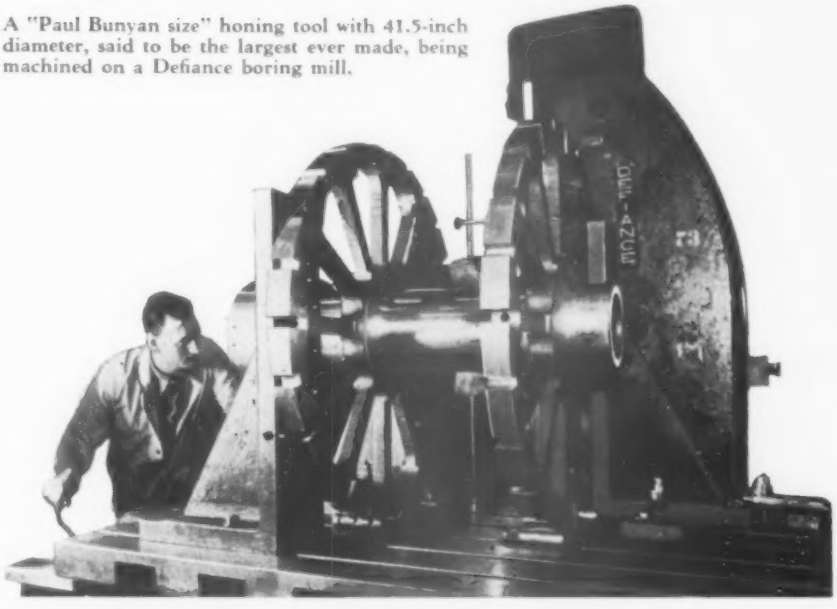
(Continued on page 130)

PRODUCTION PIX

WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING

ADDITIONAL PICTURES ON PAGE 121

A "Paul Bunyan size" honing tool with 41.5-inch diameter, said to be the largest ever made, being machined on a Defiance boring mill.



Produced by Micromatic Hone Corporation, this tool is approximately 63-feet long, weighs 6,500-pounds. It will be used in a machine built by Barnes Drill Company.

Displays like this teach workers at Republic Aircraft Products Division, Aviation Corporation, Detroit, careful workmanship.

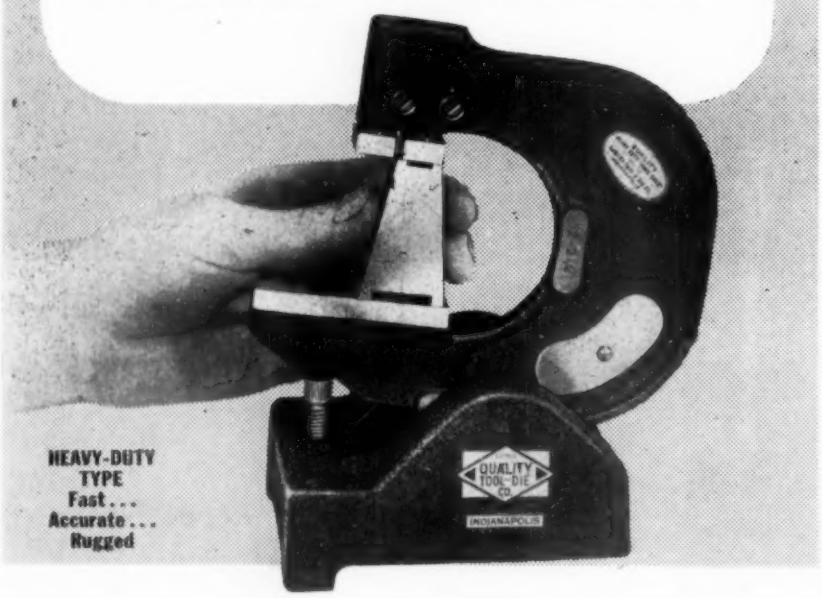
Above, Right

Operator at work grinding and finishing aircraft propeller in new safety booths installed by Curtiss-Wright's Propeller Division to reduce accidents.

Right

Finishing operations being performed on the assembled crankcase in Buick production of bomber engines for the Army Air Corps.

SPEED UP GAGING IN
Your PLANT WITH
Quality
"KWIK-CHEK"
ADJUSTABLE LIMIT SNAP GAGES



★ The gaging of odd or irregular-shaped pieces need not be a production "bottleneck." Quality "Kwik-Chek" Adjustable Limit Snap Gages are designed for speed and accuracy. Note the lower anvil extending beyond back edge of top gaging button. This helps in gaging counter-bored work. All Quality "Kwik-Cheks" are equipped with AGD Locking Device. Available in sizes: .0″ to 6¼″ in Heavy-Duty Type and .0″ to .760″ in Midget Type.

WRITE FOR ILLUSTRATED PRICE LIST

Quality TOOL & DIE CO.
Vermont & N. Noble St., Indianapolis, Indiana

MANUFACTURERS OF "QUALITY PRODUCTS"

INDUSTRIAL NEWS DIGEST

(Continued from page 129)

One adaption is a hand tool vibrator with adjustable depth timer attached to a hinged yoke. The second is a vibrator adapted to a special yoke fabricated from cold rolled steel and mounted on a pedestal. Both these tools are easily adjusted for the correct height of the finished rivet and automatically stop when that point has been reached.

* *

Lycoming: Manufacturing facilities of the Lycoming Division of The Aviation Corporation, Williamsport, Pennsylvania, have been expanded by the addition of a $500,000 plant. The firm has long been a leading aircraft engine manufacturer.

The facilities provided by this new plant, it is said, will permit Lycoming to increase its subcontract work by approximately 30 per cent and will make possible the expansion of the production of opposed type engines in the main Lycoming plant by about 20 per cent. Subcontract machine work this year will be more than double that in 1942, the company has announced. Formerly a silk mill, the new factory has been converted into a modern machining plant under authority of the Lend-Lease Administration.

* *

Ford: Already the nation's largest producer of cargo gliders, the pioneer auto manufacturer has been awarded a new and larger glider contract involving approximately $31,000,000 worth of the engineless air transports.

The ships, with a wingspread nearly that of a medium bomber, and capable of carrying 15 fully equipped soldiers, will be turned out at the firm's Iron Mountain, Michigan, plant. Approximately four months after blueprints of the Waco-designed ship were handed Ford engineers a year ago, the first Ford-built glider was ready. Automen re-designed various parts and assemblies, adapting the ship to mass production. For this work Ford engineers supervised the designing of more than 4,000 tools, many of them enormous fixtures. (See The Tool Engineer, December 1942.) The gliders are crated for export at the Northern Michigan plant.

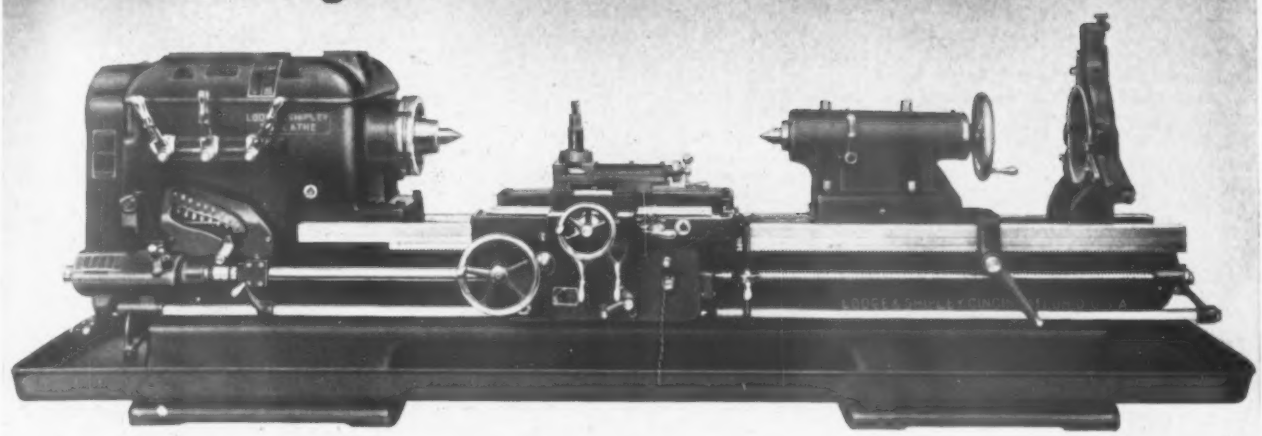
More gliders: Another indication of the immensity of the glider production job in the U. S. today came with the simultaneous announcement from Greenville, Michigan, that another $15,000,000 contract for troop-carrying engineless ships has been received by Gibson Refrigerator. This contract is larger than the initial order received by the firm last year. The ice box builder now ranks among the three largest volume producers of Army gliders.

* *

Helicopters: Tool engineers of the United Aircraft Corporation at East Hartford, Connecticut, are now at work on the pre-production stages of helicopter building for the Corporation's new division, Sikorsky Aircraft. Manufacture of the revolutionary ships, for the U. S. Army, will be in the recently acquired Crane Company plant at Bridegport, Connecticut, formerly used for building plumbing supplies. Igor Sikorsky, designer of the plane, will devote his full time to experimental work. B. L. Whelan of United Aircraft has been named Acting General Manager of the operation. THE END

(Continued on page 204)

TOMORROW'S LATHE ... TODAY!



INCORPORATING every feature necessary for easy and profitable operation, the Lodge & Shipley 25" and 27" Selective Head Lathes are powerful, heavy duty machines which reflect in every detail the experience gained over many years of specialized manufacture of lathes. Whether the job be one requiring unusually close limits of accuracy or one where speedy removal of metal is necessary by heavy hogging cuts, these lathes provide an ease of operation which permits the operator to do far more and better work with less expenditure of effort.

Write for detailed information.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

. . . CAPITAL COMMUNIQUE . . . BY T. M. REG. U. S. PAT. OFF.

. . . JAY A BONWIT = WASHINGTON

Special dispatch from THE TOOL ENGINEER'S *Correspondent in the nation's capital.*

MAJOR problem in the war production picture is maintenance of a high rate of productivity per man and machine hour.

While other nations engaged in the war, both Allied and enemy nations, have already experienced alarming drops in productivity, they have been able to compensate for the decline in man-hour productivity through operating longer hours and by a contrasting disregard for all but the rock bottom essentials of a civilian economy.

Department of Labor productivity studies have shown that our own man-hour output has dropped in civilian fields, but actually until very recently increases were noted in the war production field. This latter was accomplished through the introduction of assembly line techniques such as have been traditional to American civilian industry.

However, the armed services, through their changing needs, have interposed a new problem, that of changes in orders to industry, which in turn have interfered with assembly lines and have created the problem of lag in overall tonnage deliveries.

To offset the reductions in schedules, it has become necessary to introduce new controls over labor, with the hope that a more efficient use of the labor force will bolster the rate of deliveries. The techniques which the War Manpower Commission is attempting to use are primarily those which have been effective in Britain for some time. Essentially, they are labor freeze measures with two objectives: 1—To reduce turnover, which has created the primary problem of training and adjusting workers to plant requirements and conditions. 2—To provide a mechanism under which the labor supply can be shifted from labor surplus areas to labor shortage areas, and prevent further change except with Government approval.

The control exercised over labor is primarily implemented through the Selective Service Act. Controls over employers are largely sanctions.

Most potent sanction is the fact that the United States Employment Service will not cooperate with employers who do not observe War Manpower Commission rulings. As the United States Employment Service is rapidly becoming the sole supply source of labor for new hirings, this sanction has an immediate effect.

Still virtually untapped is the medium of increasing labor utilization. In Britain there has been in effect a comprehensive system of labor inspectors charged with policing plants so that the available labor can be used most efficiently and without made work practices introduced by organized labor or manpower hoarding practiced by employers. The War Manpower Commission has taken steps toward this end, but has failed to implement them in any way.

* * *

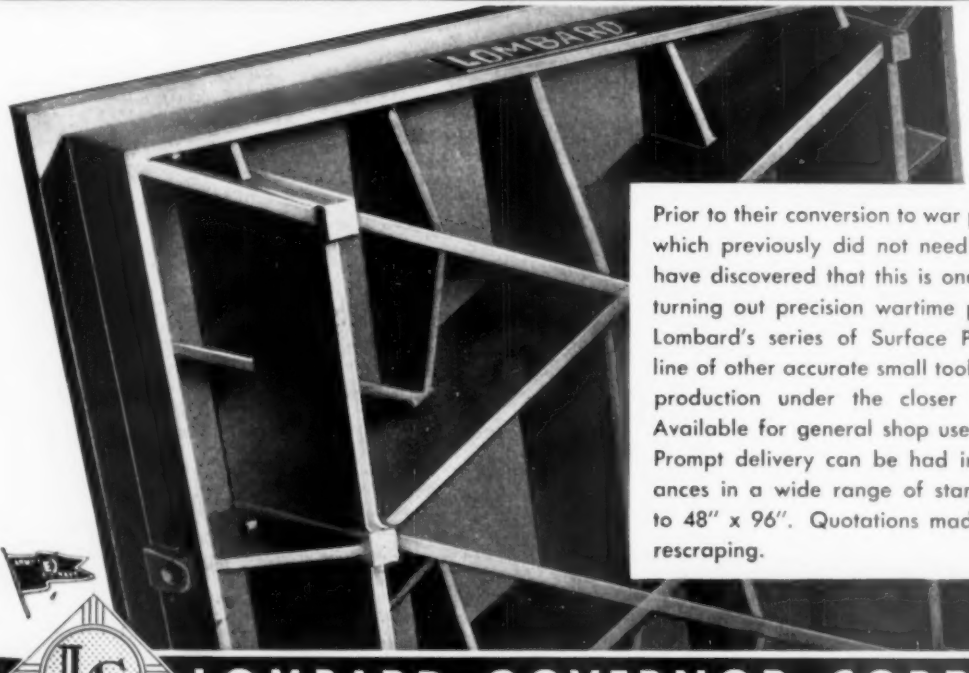
CAREFUL CONTRACT PLACEMENT

There will be a decided effort to prevent any change in the pattern of war contract distribution. Such a change might well come about if there were indiscriminate allocation of new contracts alongside cancellation of existing contracts due to changes in war requirements.

Anticipating such a problem, the

(Concluded on page 134)

INSPECTION *is Vital!*



Prior to their conversion to war production work many shops which previously did not need close inspection equipment have discovered that this is one of the prime requisites for turning out precision wartime parts.

Lombard's series of Surface Plates, as well as complete line of other accurate small tools has made possible greater production under the closer tolerances now necessary. Available for general shop use as well as inspection work. Prompt delivery can be had in various grades and tolerances in a wide range of standard sizes from 14" x 18" to 48" x 96". Quotations made also on special sizes and rescraping.

Surface Plate shown is Lombard Commercial Style.

LOMBARD GOVERNOR CORPORATION

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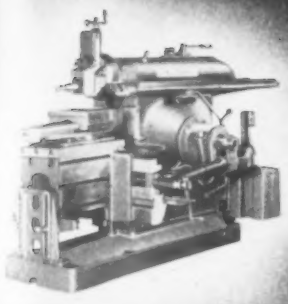

CONTOURING

... another Function of the Shaper

WHILE the Shaper is indispensable in the toolroom, it is also very much at home in manufacturing shops.

In your shop there may be jobs, involving the principle of contouring, that are best performed on a Shaper.

Cincinnati Shapers are accurate . . . responsive . . . profitable.

Write for Catalog N-2.

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS BRAKES SHEARS

(Concluded from page 132)

War and Navy Departments, Maritime Commission and the Procurement Division of the U. S. Treasury are parties to an instruction to war contractors to so place subcontracts as to utilize surplus labor wherever possible, with the obvious understanding that the Government procurement agencies will follow a similar policy in placement of prime contracts.

This policy is not far different from that advanced early in the war production picture. Now it appears likely, in view of the labor shortage, there will be closer observance of this policy.

In evaluating the Selective Service statement concerning draft policy, it is well to consider two factors. The Army is not anxious to accept men for active service who are much above the age of 24; also, the majority of calls to the armed services during the latter part of this year and during 1944 will be for service in the Navy, and this branch of the service is very reluctant to accept older men, traditionally seeking boys in the 18-year-old class.

These facts indicate the armed services will take men from the pool of unmarried men in the younger age groups and the younger fathers of the Pre-Pearl Harbor classification who are not engaged in essential activities. Emphasis will be placed on older men replacing those drafted. An attempt will be made to force this replacement through the pressure of Selective Service. If this fails, a national service act may become necessary.

The WPB is planning increased emphasis on civilian goods production, not of the luxury type, but of basic necessities.

The Office of Civilian Requirements has outlined a program which calls for a moderate tonnage of metals to provide a sufficient volume of production to make the manufacture attractive and profitable to producers.

The program in the past has not been successful, as manufacturers found it more economic to engage in full-scale war output than to divert a small portion of their capacity to civilian output.

Contract changes by the services will have the effect of making a limited volume of civilian output more attractive to producers.

* * *

NEW REGULATIONS FOR INDUSTRY

Recent actions of importance to production engineers follow:

July 19—WPB issued Directive 23, as amended, aimed at simplification of procedures for review of purchase orders of capital equipment and machine tools by the Army, Navy and other Government agencies.

July 22—Manufacture and sale of bonded and coated abrasive products were brought under control through issuance of Conservation Order M-319-a. Effective August 1, the order provides that no producer or importer shall manufacture or sell any bonded abrasive product which contains abrasive grain manufactured from fused aluminum oxide (other than reclaimed grain) or any grit size 80 or coarser, which is intended for use in a selected list of bonded abrasive products. The same provisions apply to manufacture and sale of coated abrasive products.

July 31—WPB directed producers of aluminum that if they find they cannot make delivery in a specified month after accepting an order for delivery in that month, they may make delivery in any subsequent month up to and including the first month of the following quarter without reporting to WPB. If the order cannot be filled in this period, the producers must notify WPB, giving customer's name and details. The order may still be filled at a later date. Back orders are entitled to prior position of Production Scheduling, and the customer must be notified of what to expect.

August 4—CMP regulation 1, amendment 2, provides that sample orders for certain controlled materials, including stainless steel, tool steel and steel castings, may not call for amount delivered in any month to one purchaser of more than one per cent of minimum mill quality.

August 5—WPB set up machinery to provide essential civilian aircraft with sufficient supplies to keep them in proper repair, through an amendment to Preference Order P-47. Action permits assignment of preference ratings and the allotment of controlled materials necessary for the operation of commercial air liners, planes of the War Training Service, and Civil Air Patrol Aircraft. THE END.

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Reamers • Circular and Flat Form Tools

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Gear Shaper Cutters • Gear Cutters
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Durability . . . of high quality cutting tools

ARMY E NAVY

NATIONAL TOOLS ARE THE SHAPERS OF PROGRESS

The NATIONAL TOOL Co.
11200 MADISON AVENUE . CLEVELAND, OHIO

Stepping Up...and Keeping Up the STEEL CUTTING PRODUCTION of the United Nations

WITH the outbreak of war in 1939, the Allied Nations—abruptly cut off from Germany as a principal source of supply for carbides—diverted the full flood of their carbide demands to the United States.

Fortunately, American industry had established—as far back as 1928—its own independent sources of supply. These American suppliers were ready to meet the emergency with a background of 10 years' experience in the development, manufacture and application of this urgently needed material. They had the skill, the equipment, and a generous margin of reserve capacity.

To the hard pressed Allied Nations—struggling to offset the tremendous output of a German war production long since tooled with carbide *by official decree*—went tons of American carbides in steadily increasing quantities. Foresight and preparedness enabled American carbide manufacturers to fill this urgent need and at the same time meet the pyramiding demands of domestic industries.

Today, you will find carbides a factor of vital importance in stepping up and keeping up the production of not only the United States but also such countries as England, Russia, Australia, Canada, China, India, Mexico and many others among the United Nations.

The full extent to which carbides are being used in the cause of victory is difficult to visualize. Carboloy Company production alone, for example, is at an annual rate 45 times greater than that of any pre-war year. Monthly production of carbides—formerly measured in pounds—can today be expressed in tons—many tons per month! Yet the average carbide tool contains but a fraction of an ounce of carbide at the cutting edge—and a single tool during its usable life machines hundreds of parts for the implements of war. Particularly important is the use of carbides for cutting steel—a major field of use for Carboloy tools. (More than 60% of the Carboloy Cemented Carbide produced today for machining purposes is for cutting steel.)

A high order of performance—so high as to have been once considered incredible—is now commonly expected, and obtained, with carbides. Such things as increases in output of 3 to 1, lengthened tool life of 10 to 1, finish cuts that eliminate arduous grinding, machining of former "non-machineable" alloys, reductions of 25%, 50%, 75% in machining costs—results such as these are every-day occurrences in war production today.

This widespread use of carbides in war, indicates a new era of production economy when normal commerce returns. Manufacturers who have converted to carbides to meet the present emergency will then have at their immediate disposal an economic weapon of unusual advantage in seeking world markets.

Carboloy Company, Inc., Detroit, Mich.

Authorized Distributors: Canadian General Electric Co., Ltd., Toronto.
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TITANIUM — TANTALUM — TUNGSTEN CARBIDES

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FROM STOCK
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HIGH GRADE TOOLS

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Guaranteed

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Prompt Delivery on Special Tools, Dies, Jigs And Fixtures Made To Your Exacting Requirements

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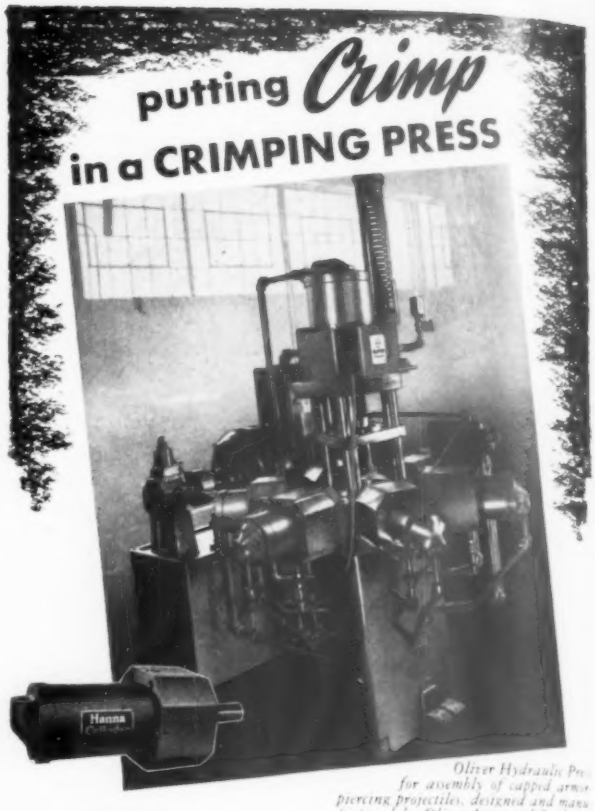

Oliver Hydraulic Press for assembly of capped armor-piercing projectiles, designed and manufactured by Oliver Iron and Steel Corporation, Pittsburgh, Pennsylvania. Employs seven Hanna Hydraulic Cylinders.

. . . with
HANNA HYDRAULIC CYLINDERS

PUTTING "crimp" in a Crimping Press is just another of the 1001 uses for Hanna Cylinder-Power. Six Hanna Hydraulic Cylinders on the Oliver Shell Crimping Press, shown above, deliver the powerful squeeze which crimps the cap skirt to the body of lethal armor-piercing shot. A seventh Hanna Hydraulic Cylinder holds the shot in position.

Wherever there is a job involving a pushing, pulling, pressing or clamping action, Hanna Cylinders will do it smoothly, efficiently and economically. There is a Hanna Cylinder to meet nearly every conceivable mounting requirement — designed to operate with air, water or oil — at pressures up to 1500 pounds.

Do you have cylinder-power applications in your plant? Without a doubt you do. Ask a Hanna Engineer to go over them with you, for the chances are he can point out many ways in which you can simplify, speed-up and economize operations.

Send for these catalogs — they will give you complete details on Hanna Air and Hydraulic Cylinders

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1765 ELSTON AVENUE • CHICAGO 47, ILLINOIS
AIR & HYDRAULIC CYLINDERS • RIVETERS • AIR HOISTS

Wheels for *any* CENTERLESS Grinding Job!

There are reasons for BAY STATE Superiority through Scientific Manufacturing Control.

1. FRACTIONAL GRADES — permit a wider range for a more accurate wheel selection.
2. CONTROLLED POROSITY — assures duplication.
3. H9 BOND — offers cooler cutting, greater wheel life, better production.
4. PATENTED INSTRUMENTS — for checking the hardness of grades. *Send for Bulletin.*

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

A WISE WAR TIME PURCHASE

A LONG - TERM PEACE TIME INVESTMENT

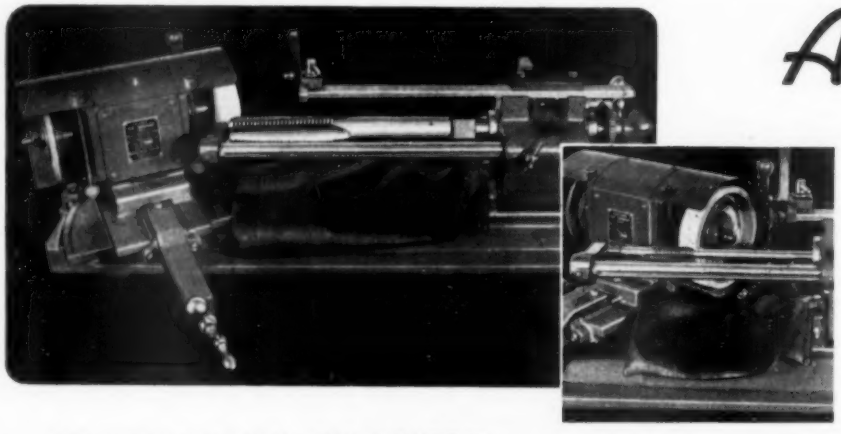
Remember—these same O K Metal Cutting Tools you now find such a help in speeding up war work will be just as valuable in your post-war set-up. By then, your investment will just be getting under way! Their great flexibility of use will put them to work on any product you care to manufacture. Yes, O K Tools are best in war, best in peace, best wherever performance counts!

"O K" FOR EVERY METAL CUTTING JOB

THE O K TOOL CO., SHELTON, CONN.

THE TRADE O K MARK SYSTEM

OF INSERTED-BLADE METAL CUTTING TOOLS



Announcing

THE NEW No. 2 BLAKE TAP GRINDER

The New No. 2 Blake Tap Grinder will sharpen the chamfer on taps from No. 0 to 2 inches, and up to 14 inches long. Except for increased capacity, the No. 2 retains all the proven construction features of the No. 1 machine. The longer segment under the wheel head slide allows the head to swivel to the back of the work. Thus shell type taps, or taps with long pilots, clear the wheel head, yet are rigidly supported as shown in photo at right. Conventional taps are sharpened in the usual way as shown at the left.

Change gears are provided for sharpening 2, 3, 4, 5, 6, 8 or 10 flutes, either right- or left-hand.

Complete details on this money making machine will be found in the new Bulletin No. 5—send for your copy today.

— FOR DETAILS MAIL THE COUPON —

Please send Bulletin No. 5 covering the No. 1 and No. 2 Blake Grinders.

NAME ..... TITLE .....

COMPANY .....

STREET .....

CITY ..... STATE .....

T.E.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

WOMEN OPERATORS SAY
"Thumbs Up!"*
Thor
*Studies show that the natural grip of most women operating a small drill is the "thumbs up" one pictured here. The handle of THOR's "plastic" drill is especially designed to make the most of this trait.

TO THE NEW Thor "ARMORED IN PLASTIC" 1/4" ELECTRIC DRILLS

The "thumbs up" grip that women generally use in operating the new Thor "Armored in Plastic" drill also expresses the way they feel about this remarkable new tool—*they like it!*

They like its 14% less weight! With housings of light but sturdy "Thorite" plastic, these heavy duty portable electric drills weigh fully 14% less than previous types. That means less fatigue and greater productiveness.

They like its new handling ease! The perfect balance and trim lines of the new Thor drills, plus the "kind" feel of the plastic housing itself, provide handling ease never before possible.

They like its cooler operation! The new Thor "plastic" drills run cooler for two reasons. The plastic "Armor" is a non-conductor of heat. The oversize Thor fan and ample intake and exhaust slots circulate generous amounts of cooling air through the machine.

They like its greater power! The new Thor "Plastic" drills, powered by the famous Thor high torque, over-capacity motor, develop more power per pound.

You, too, will like the way these new Thor "Armored in Plastic" portable electric 1/4" drills point the way to top speed production. If yours is a war industry, Thor's *quantity output* will enable you to get them *quickly!* Ask for full details.

"Tools are weapons—treat 'em right."

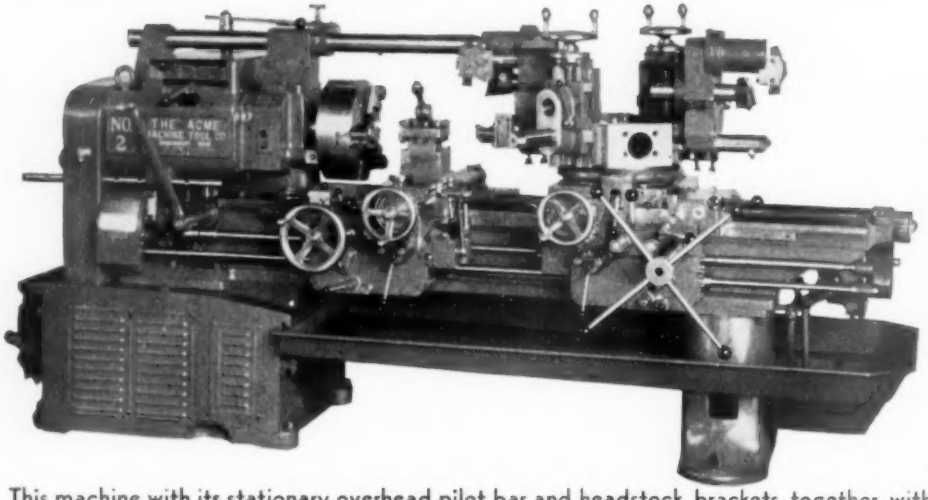
Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO, ILL.

Branches in Principal Cities

RIGIDITY and ACCURACY
UNDER HEAVIER CUTS AT FASTER SPEEDS!



No. 2 Universal Turret Lathe with stationary overhead pilot bar and headstock brackets. Heavy duty multiple turning heads and vertical slide tools and heavy duty reversible cutter holders. Also shown is the lead screw type chasing attachment with split nut brackets and threading dials on both carriages.

This machine with its stationary overhead pilot bar and headstock brackets together with rigid turret tooling permits heavy multiple cuts. Thus accuracy is assured, while faster speeds are possible by the use of cemented carbide cutting tools.

WRITE FOR COMPLETE DETAILS

THE ACME MACHINE TOOL COMPANY

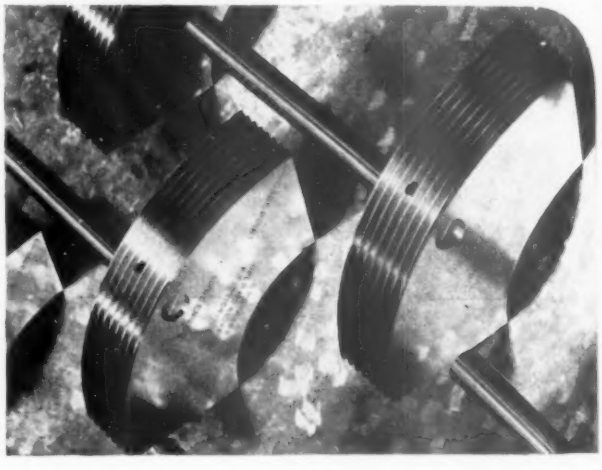
CINCINNATI, OHIO

☆ DEPENDABLE SOURCE FOR

SPECIAL OR STANDARD GAGES

OF ALL TYPES

☆



These special segment thread gages, are examples of the wide variety of thread, plug, and ring gages being regularly produced in our plant. Designed by our staff of engineers and manufactured to specified tolerances, they represent the highest skill and craftsmanship. The same high standards apply to special tools, fixtures, machines and parts, produced singly or in volume on contract. Our facilities and equipment are equal to the finest in the country. Write for literature describing these special engineering and manufacturing services, and our line of standard gages, carried in stock for prompt shipment.

MERZ *Engineering Company*

INDIANAPOLIS 7, INDIANA

Here's Help to Avoid Tool Hardening Troubles that Interfere with War Production . . .

Getting hardening results that assure the kind of tools that give longer uninterrupted production is largely a matter of two things. First, having the right steel. Second, having complete heat treating data. And on each of these points, Carpenter is prepared to help you.

The Carpenter Matched Set Method of tool steel selection provides you with a system for selecting the *one* steel that is best for each tool you make.

For help in heat treating the Carpenter Matched Tool Steels, your nearby Carpenter representative will be glad to give you the benefit of his long practical experience. He can render on-the-spot service—keep you in touch with our Metallurgical Department—and supply you with literature packed with helpful information. Here, for example, is basic information on the laws of quenching.

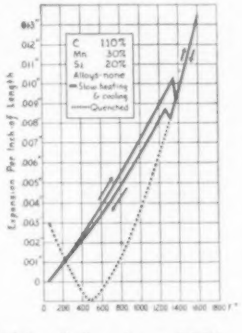
The Four Fundamental Laws of Quenching

LAW NO. 1—Steel is stronger cold than hot. Everyone knows that steel is easier to bend, shape or deform when it is hot. Therefore, when hot steel comes into conflict with cold steel, the cold steel always wins. *(This law explains why a steel rod quenched horizontally will warp upward at the ends.)*

LAW NO. 2—Steel expands when heated and contracts when cooled. This is illustrated by the solid curve in the chart, which shows the behavior of a piece of high carbon tool steel heated and cooled slowly in a furnace. Starting at room temperature, the steel gradually expands up to about 1350°F. when it will be about .010" longer per inch than it was when it started. Here, it reaches the critical point, and while going through the critical, it shrinks somewhat. Above the critical, it continues to expand at a more rapid rate.

On cooling slowly, it shrinks until it reaches about 1310°F., expands while going through the critical and then shrinks back to its original size as room temperature is reached. *(The importance of this law is obvious—since, if different parts of a tool are not cooling at the same rate, stresses will be set up in proportion to the difference in cooling rates.)*

LAW NO. 3—Some tool steels increase in volume when hardened. This is particularly true of water-hardening tool steels. The dotted line in the chart shows the approximate course through which carbon tool steel would travel if it were quenched instead of being cooled slowly. It would continue to shrink (without any critical point interruption) to some temperature in the neighborhood of 500°F. As it cooled below this temperature, it would expand until it would finally be about .003" per inch longer than it was when it started in the annealed condition. *(This law explains why some tools change size in hardening and why some break in the quenching bath. Size change as such is not necessarily disastrous, but if the volume change in part of the tool differs greatly from that in an adjacent part, cracking may result.)*

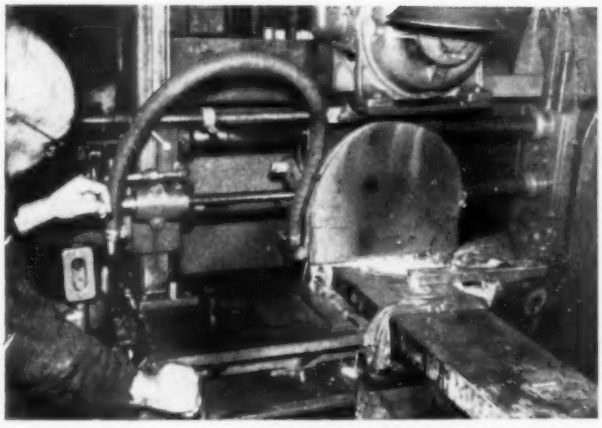


LAW NO. 4—All steels when stressed under the elastic limit have the same elastic properties—regardless of composition or heat treatment. This may seem impossible, but it is true nevertheless. All steel, regardless of its analysis or heat treatment will stretch exactly .001" per inch under a load of 30,000 lbs. per sq. in. *(This law makes possible the measurement of internal stresses in a piece of quenched tool steel, by simply measuring the amount of distortion. By such a study, it is possible to obtain information to control the quenching operation so as to minimize warpage and breakage.)*

Much helpful information on quenching, like that above, is contained in "Tool Steel Simplified". It is only a small part of the practical information on tool making given in the book. You can put all its useful facts to work in your tool room by making copies available to your tool room men. "Tool Steel Simplified" is available *at cost*, $1.00, in the U. S. A.—$3.50 elsewhere.

THE CARPENTER STEEL COMPANY
139 Bern Street, Reading, Pennsylvania

Carpenter MATCHED TOOL STEELS



No. 302 Campbell Abrasive Cutting Machine cutting 18-8 Stainless Steel forging blanks from slab 2⅝" x 10" x 14'

Campbell DOES ANOTHER PRODUCTION CUTTING JOB THAT "COULDN'T BE DONE"

● The job placed in the lap of a nationally known manufacturer of drop forgings made it necessary to cut 18/8 Stainless forging blanks from flat stock 2⅝" x 10" x 14'—cut-off lengths 9¾".

Without a **CAMPBELL**, cuts took so long that it was impossible to maintain production.

Now a **CAMPBELL No. 302 ABRASIVE CUTTING MACHINE** makes those cuts in 10 minutes—finished, burr-free cuts to dimension, without waste.

If you write the Campbell Engineering Department, they will develop production procedure and costs for you, too, without any obligation.

State materials, shapes and sizes you are cutting. Give lengths of stock, lengths of cut-off pieces and production rate required.

The data worked up for you will be based on actual experience. Remember **CAMPBELL** manufactures the only complete range of abrasive cutting machines—8 types and 19 models—and these machines are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramics. Solid bars, tubular and flat stock.

Campbell

ABRASIVE CUTTING MACHINES

ALSO MANUFACTURERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

. . . the performance of YOUR HYDRAULIC EQUIPMENT *with* WARCO HYDROIL!

Performance on all types of hydraulically operated systems more closely adheres to new machine productivity when you use Warco Super and E.P Hydroils. New smoothness and efficiency of operation plus stepped-up production result from the following eight operating advantages:

1. Reduced friction and wear; 2. Extra service life; 3. Ease of operation; 4. Easy cold starting; 5. Clean reservoirs, pumps, and valves; 6. Decreased maintenance costs; 7. Uniformity of product; 8. Increased economy.

Warren pioneered the production of "extreme pressure" inhibited hydraulic oils. Its extensive laboratory knowledge of fortified lubricants and the skill of its field engineers in the application of hydraulic fluids together with a complete line of Warco Super and E.P. Hydroils assure you of trouble free operation of all types of hydraulic equipment.

A seventy page manual, "Controlled Maintenance Plan For Hydraulic Systems," is available free on request. It is full of valuable information.

Send for it today.

Specialized PRODUCTS

THE WARREN REFINING AND CHEMICAL CO.
CLEVELAND 5, OHIO

VAN NORMAN HIGH FREQUENCY INDUCTION HEATING

Section of tube brazed by Van Normanizing. Heating time—6 seconds.

In the illustration, collars are brazed to tubes in 6 seconds with Van Norman High Frequency Induction Heating. Bonds are clean, tight and uniform. The finished part has no discoloration and is free from scale, thus cleaning operations, which are usually necessary when torches and other brazing methods are used, are eliminated, spoilage is minimized, and piece after piece is brazed with the same uniform results. Obviously, VAN NORMANIZING produces a better finished part, speeds output and reduces costs.

By using the proper work-holding fixture and heating coil, a number of workpieces can be brazed simultaneously. Odd-shaped parts are just as easily brazed by Van Norman High Frequency Induction Heating as uniform parts.

It will pay you to investigate Van Norman High Frequency Induction Heating for Hardening, Brazing, Soldering, Annealing and other applications requiring localized heat.

"It pays to Van Normanize"

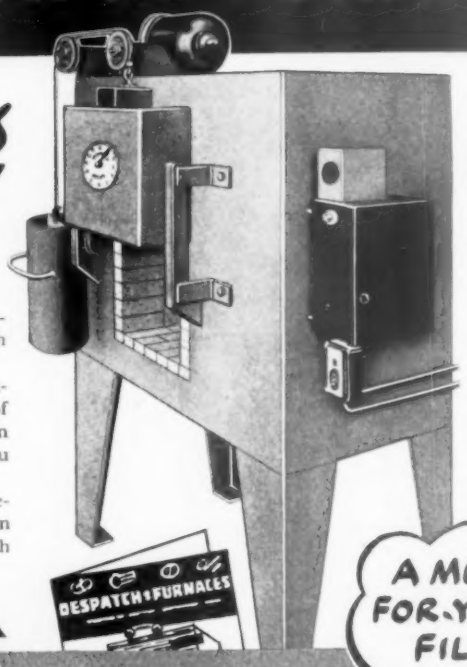
ARMY E NAVY

VAN NORMAN MACHINE TOOL CO.

SPRINGFIELD, MASSACHUSETTS

USE DESPATCH FURNACES

Where Hardness must be right!



When ±1 Rockwell Readings are obtained from successive batches of tools or parts heat-treated in a Despatch furnace, it's proof of dependable accuracy.

But when this same performance is maintained in continuous 24-hours-per-day operation, with a wide variety of materials and at different processing temperatures—then you know you have an *exceptional* furnace. One that you can count on for unfailing results, always.

Remember this, when selecting a furnace for *your* tool department or shop: no heat treating job is too exacting—in accuracy, uniformity, speed or flexibility—for a Despatch furnace. *Complete details on request.*

ACCURATE
for precision treatment through entire range, 275°-1250° F.

UNIFORM
heat through chamber assures ±1 Rockwell readings.

SPEEDY
heat penetration and extra-fast recovery. No overshoot or lag.

FLEXIBLE
for many different processing needs. Extremely adaptable for tool-room usefulness.

DESPATCH OVEN COMPANY MINNEAPOLIS

WRITE FOR NEW BULLETIN NO. 83

HOPPERS and SCREWDRIVERS

FASTEST FEEDING HOPPER EVER DESIGNED!

•

ADAPTABLE TO ANY MACHINE!

•

NO JAMMING OR LOCKING!

•

HOPPER FEEDS: Bullet Cores, Rings, Pins, Rivets, Nuts, Screws, Discs, and Special Parts.

DRIVE SCREWS the MODERN WAY

•

REDUCE COSTS INCREASE PRODUCTION

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THREE MODELS

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No. 2 to ⅜ Screws

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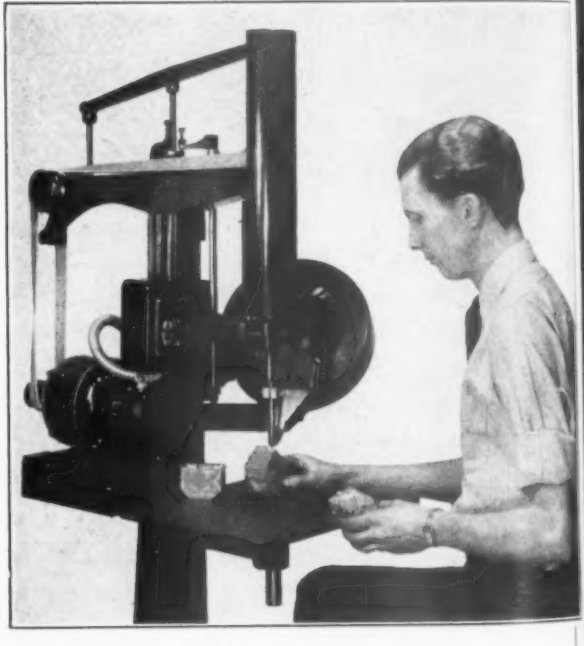
Send Samples For Production Estimates

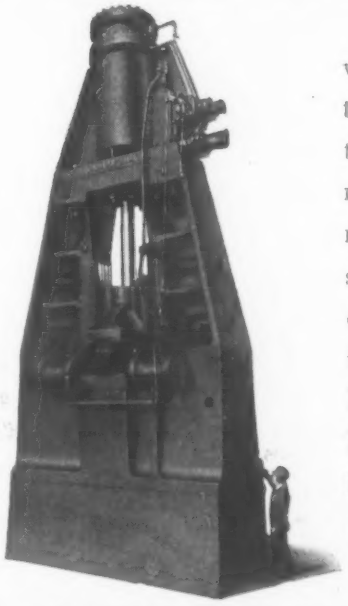


DETROIT POWER SCREWDRIVER CO.

2805 W. FORT STREET DETROIT, MICHIGAN

FORGING COMES *FIRST*

FORGING comes first in the production of any metal part requiring strength with toughness and minimum weight. This is true in times of peace, but much more so in times of war, when metals, like humans, must stand up under unpredictable loads. • Before the great machine tools can turn out the highly finished, microscopically accurate crankshafts, connecting rods, valves, gears, axles, airplane parts, tank parts, gun parts and the thousands of other parts vital to mechanized warfare, the hot metal must secure its great strength and toughness and its close-to-finish shape under the impact of the drop hammer. • For over 45 years, Chambersburg Hammers, in war and in peace, have been helping industry do this job.



CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

ARMY E NAVY

CHAMBERSBURG

HAMMERS · CECOSTAMPS · PRESSES

THESE HYDRAULIC UNITS WILL GIVE YOU ADDITIONAL MACHINING CAPACITY

[with Present Equipment]

1 *Compact Hydraulic Unit for Rifle Chambering Machine.*
2 *Complete Self-Contained Hydraulic Unit for Special Machine.*
3 *Panel Unit complete except for tank which is integral with Machine.*
4 *Self-Contained Hydraulic Unit—Complete with Pumps, Valves and Tank.*

A Simple Change in YOUR Machine Design

By simply converting your mechanical feed transmission to smoother hydraulic feed you can shift all the equipment now used to cut gears, splines and cams to other urgent work. In addition, you release the precision machine tools now used to mill, drill and bore mechanical feed transmission housings for other work. You also gain all the skilled man power now used on these operations. Figure your own savings. Then design your machines with hydraulic feed. Here's how:

USE BARNES UNIT-TYPE HYDRAULIC FEED TRANSMISSIONS

The Barnes Unit-Type method of securing hydraulics for metal working machines and other mechanical structures offers one of the fastest and most efficient hydraulic design services available.

Complete circuits are designed and built from Barnes standard hydraulic elements — pumps, valves, etc. These are assembled in compact, self-contained units or panels simple to install — **SAVES DESIGN AND ASSEMBLY TIME, SPEEDS DELIVERY.**

TWO METHODS AVAILABLE

Method 1—Barnes Self-Contained Hydraulic Unit can be designed with necessary pumps and valves to complete hydraulic functions of your machine. Oil reservoir is included — providing cylinder space and connecting two pipes to each cylinder constitutes your total hydraulic effort.

Method 2—Use a Barnes Panel Unit—similar to above, except provision must be made in machine for oil reservoir and motor mounting.

FREE DATA

40 page booklet contains detail descriptions of Barnes Hydraulic elements and typical installation circuits. Write for your copy today. Ask for Bulletin T.E. 943.

John S. Barnes Corporation

DETROIT SALES OFFICE
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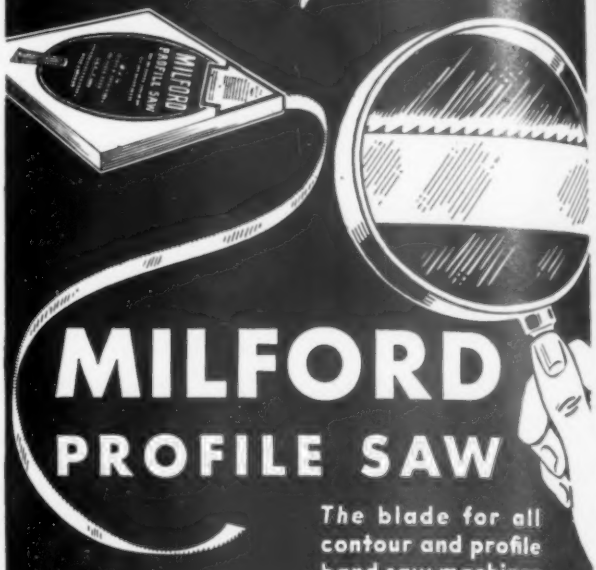
MAIN OFFICE AND FACTORY
ROCKFORD, ILL.

An improved



MILFORD PROFILE SAW

The blade for all contour and profile band saw machines

From Saw Specialists comes the latest answer to the problem of getting maximum and uniform cutting production from all contour and profile band saw machines. A new automatically controlled method of heat treatment of metal cutting saw guarantees the uniform depth of hardness of every foot of PROFILE SAW. Uniform depth is tested by "etching" sample pieces of each saw... the surest, oldest method known to metallurgy.

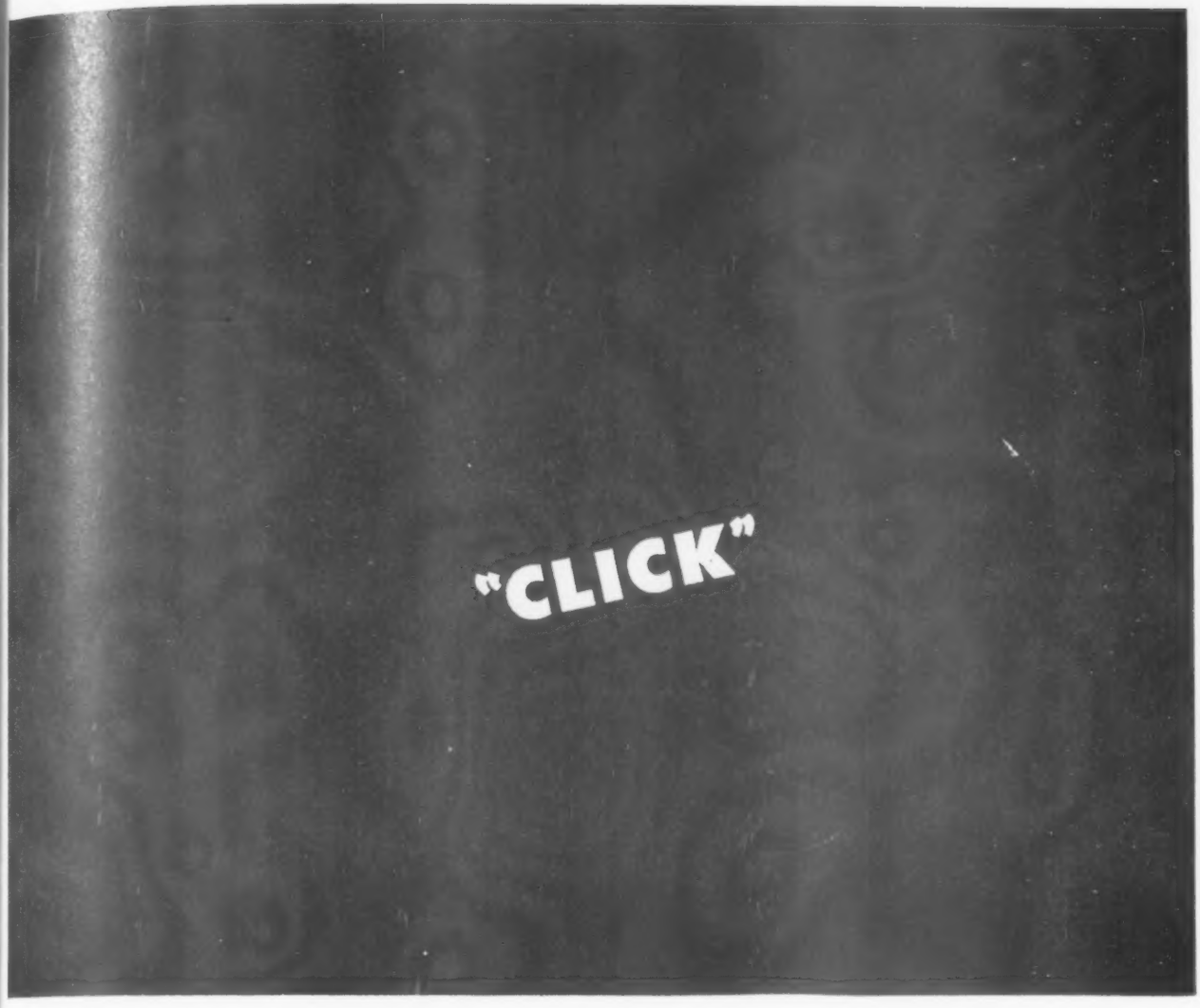
Research in our own shops never stops... even under the pressure of War Production, and the accurate control of the depth of hardness of each tooth is but one of several new developments.

MILFORD PROFILE SAW is made and guaranteed by its originators and the world's largest producer of metal cutting band saw blades.

Order from your mill supply distributor

Perhaps you have not yet adapted your band saw machines to Profile Sawing. In that case be sure to write us for directions giving description of cutting jobs and machines.

THE HENRY G. THOMPSON & SON COMPANY
NEW HAVEN, CONNECTICUT
Also makers of MILFORD REZISTOR HACKSAW BLADES



Picture of a man using a torque wrench

The New Livermont Torq-Snap Wrench can be used efficiently in total darkness and in noisy areas as well—inside a wing, hull or semi-dark hanger—on the flight ramp or on the field with engines running. When the proper predetermined torque load is reached, the Torq-Snap gives an audible "click" and a small plunger taps the operator's hand (see arrow). *No visual attention.* No dials or battery operated indicators.

The Livermont Torq-Snap has passed exhaustive tests. It operates within a very close tolerance—eliminates variations formerly unavoidable in aircraft plumbing connections.

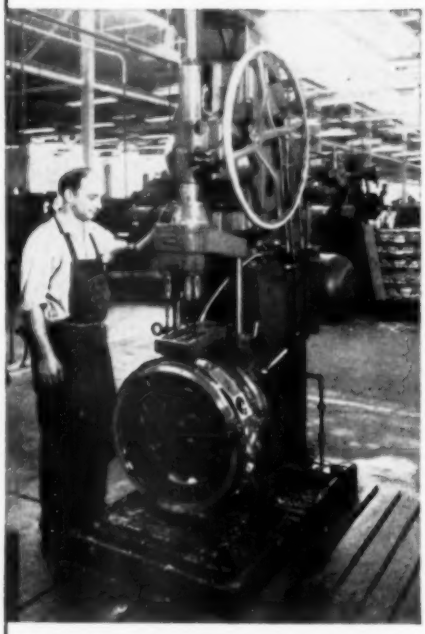
Twelve sizes are available with open or box ends, either offset or straight. Write for complete specifications (on your firm letterhead, please). If you handle aircraft tubing, send for booklet "Tubing and Pipe Protection Methods."

TUBING SEAL-CAP, INC.
215 W. 7th STREET, LOS ANGELES
East. Representative, 428 New Center Bldg., Detroit

A VERSATILE DRILLING MACHINE

FOR *MANY* TAPPING, DRILLING AND REAMING OPERATIONS

Airplane supercharger blower being drilled by BARNESDRIL *No. 262 Drilling Machine.*



Fixture on this BARNESDRIL *No. 262 Drilling Machine indexes for airplane crankcase.*

For Single or Multi-Spindle Drilling

The BARNESDRIL Sliding Head Machine No. 262 is used for single or multi-spindle drilling at a relatively small investment for lower operating cost. All bearings are self-oiling, and there are eight quick-change spindle speeds and eight quick-change feeds.

Airplane Parts are drilled by the BARNESDRIL No. 262 Drilling Machine in a large airplane plant. In the illustration on the right, seven holes are drilled in this supercharger with one pass of the head, four holes are $1\frac{1}{4}''$, one hole $1\frac{1}{8}''$ and two holes $1\frac{1}{2}''$ in diameter. In the illustration on the left, a BARNESDRIL Machine drills four holes $2\frac{7}{64}''$ diameter in one operation on this crankcase. A fixture on this machine indexes the part for drilling four holes in each of six pads.

For Other Drilling Operations

For heavier drilling operations there is the BARNESDRIL Hydram, while for other special work, our engineers will promptly assist you in developing applications of the BARNESDRIL Machine for any drilling operation. There is also the line of BARNESDRIL Honing Machines.

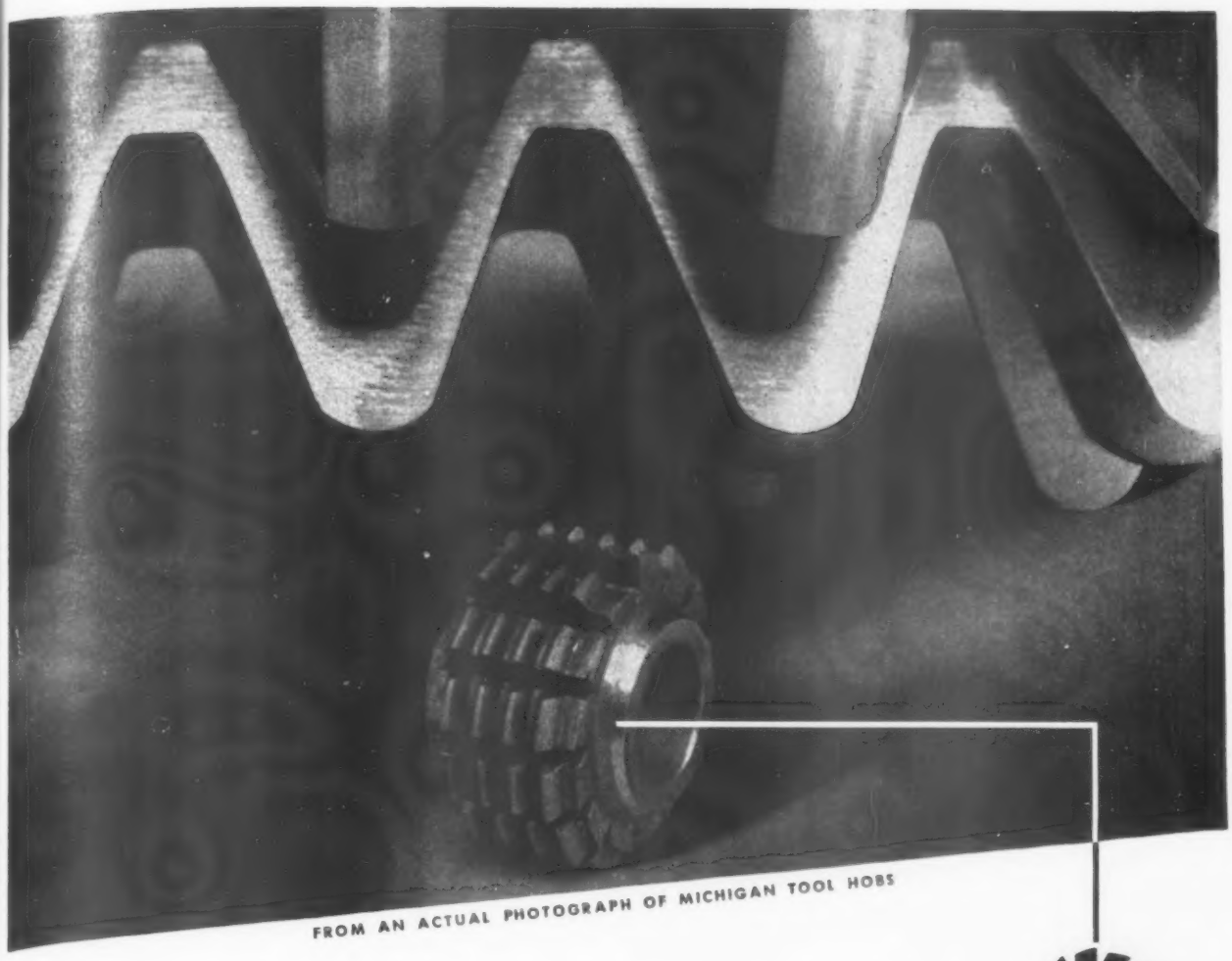
Engineering Data on drilling, tapping and reaming operations and the complete line of BARNESDRIL Equipment available. Write for free copy of Bulletin T.

Barnes Drill Co. 848-71 CHESTNUT ST. ROCKFORD ILLINOIS, U.S.A.

MORE PRODUCTION PER MAN HOUR
These smaller size Niagara Inclinable Presses offer the same design features of larger Niagara models. The instant acting 14-point sleeve clutch is an important factor in increasing the output per man hour. It is possible that one or more of these presses can help you in speeding up production of urgently needed wartime material.
A1½
A2
A2½
A2½
NIAGARA

NIAGARA MACHINE & TOOL WORKS
BUFFALO, 11, N. Y.
DETROIT • CLEVELAND • NEW YORK

BUY UNITED STATES WAR BONDS AND STAMPS



FROM AN ACTUAL PHOTOGRAPH OF MICHIGAN TOOL HOBS

Actual Size

IF HOBS COULD TALK . . . . .

GOLIATH: Hello, small fry, where did you come from?

DAVID: Same place you did — Michigan Tool Company. And don't call me small fry. Even if I am only a ¾ incher, I'm doing just as man size a job as you are.

GOLIATH: Piffle, infant. Why—you know what I do? I cut the teeth in battleship turbine reduction gears that run 8 ft. across or more.

DAVID: Just a 'hogger'!! Why, listen—I've got the iob of cutting teeth on fine instrument gears and they've got to be held to less than two tenths of a thousandth.

GOLIATH: Hey, wait a minute. Just because I'm in the big time, doesn't mean that I'm not there to the last decimal. I'm streamlined, I am — ground all over, just like you.

DAVID: That's all right, big fellow, I wasn't trying to belittle you. After all we belong to the same family and we're both doing the best job we know how.

GOLIATH: Yep, they *do* say that about Michigan hobs, don't they?

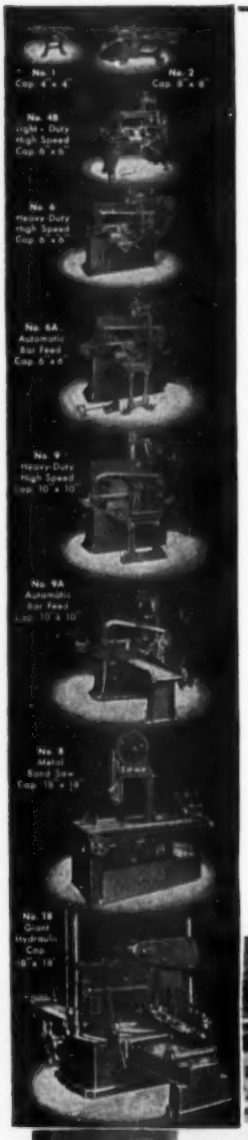
. . . and if you want to help your hobs do a still better job, write for a copy of "Hobbing". Ask for Booklet No. 149 A.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD • DETROIT 12, U. S. A.

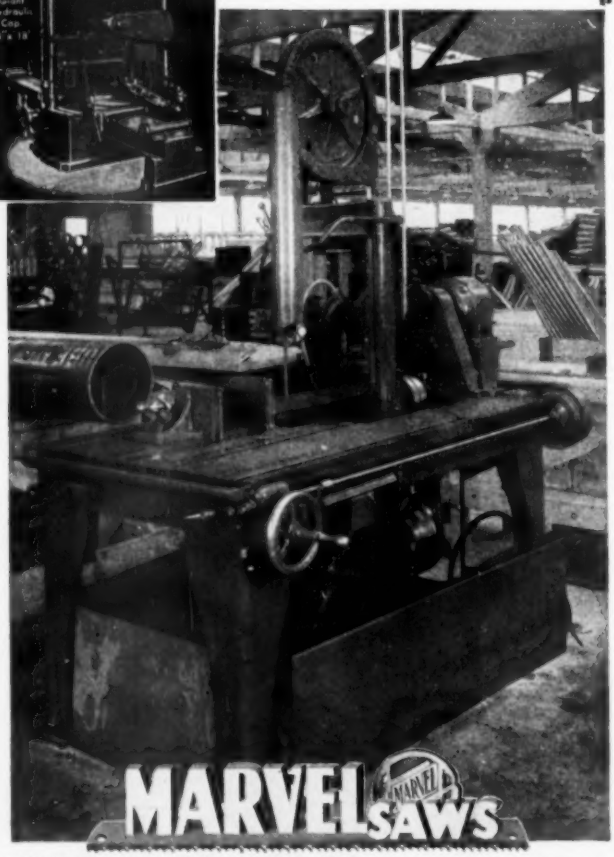
BUY U.S. BONDS STAMPS



MARVEL SAWS

"A GREAT IMPROVEMENT OVER PREVIOUS CUTTING METHODS" SAYS BELL & GOSSET CO.

Among the first machine tools installed in the new plant Bell & Gosset Co. manufacturers of hot water heating specialties, have just completed for the manufacture of "B & G" Hot Water Heating Specialties, was a MARVEL No. 8 Metal-cutting Band Saw—the most universal metal cutting saw built. They report that this saw which they use to cut-off, cut-out and trim 3½", 5", 7" and 10" seamless steel pipe, sheets, plates and castings, "handles the work easily and is a great improvement over the previous method of cutting with a torch."



ARMSTRONG BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Av., Chicago, U.S.A.—Eastern Sales Office 225 Lafayette St., N. Y.
Buy from your local distributor

HYBCO TAP GRINDERS

Lengthen Tap Life — Salvage Broken Taps
Improve — Increase Production

SHARPEN TAPS AFTER CENTER IS DESTROYED
Bench, Floor, Floor Exhaust Models. Capacities: Machine Screw to 1½" Hand Taps. Write for Catalogue.

HENRY P. BOGGIS & COMPANY
1279 W. Third Street • Cleveland, Ohio

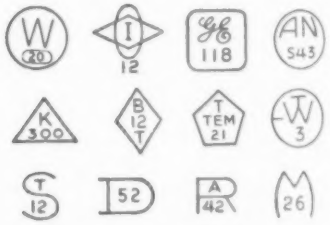
ANY DESIGN OR LETTERING

*Reproduced in "Safe-Hed"**

STEEL STAMPS

*REG. U. S. PAT. OFF.

Matthews skilled craftsmen will accurately reproduce your trade mark. . . symbol. . . monogram . . . special lettering or design in sturdy built, "Safe-Hed" Steel Stamps . . . for inspection marking of your products or work identification stamping. Here are a few typical examples:



Write for Bulletin A-1

This valuable bulletin illustrates hundreds of stock symbols, and ideas for special designs for inspection or work identification stamping. Write for your free copy today.

JAS. H. MATTHEWS & CO.

3945 Forbes Street Pittsburgh, Pa.
Branch Plants
New York, Boston, Chicago, Philadelphia, Newark, Syracuse
District Sales Offices
Cleveland Detroit Hartford Birmingham

In the Production of

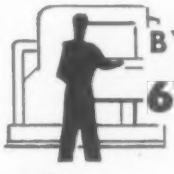
JUST ONE GUN PART

BROACHING

HAS SHOWN THIS SAVING IN MEN AND MACHINES

BY BROACHING

8 MEN - 8 MACHINES



BY FORMER METHOD

61 MEN - 61 MACHINES

In one of our Arsenals 61 men and 61 machines were engaged in machining a certain gun part. Now the same rate of production is maintained on the same part by 8 men and 8 broaching machines. This means that 53 men and machines are available for other work. It means that the cost of these parts is greatly reduced.

If you find it difficult to meet production schedules with your present equipment you undoubtedly can step up your production by broaching. Much of the increase mentioned above, for instance, was made by broaching several surfaces in one stroke.

On a production problem that broaching will solve, talk it over with a Detroit Broach man. There's no obligation, of course.

Complete Broach Service

ARMY (E) NAVY

DETROIT BROACH COMPANY

20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

EXTRA STRENGTH
Can Save Time and Labor

When three screws can do the work of four, five or more, they save drilling, tapping and assembling time and labor. They speed production and cut costs.

Mac-it Hexagon Head Cap Screws are heat-treated for maximum strength and toughness. This extra strength can be used to provide ample holding power with fewer screws.

The Mac-it "m" on the hex head is your guarantee of quality. It appears on all diameters 1/4" to 3/4", inclusive.

OTHER MAC-IT PRODUCTS INCLUDE:

Hexagon Socket Cap Screws, Hollow Set Screws
Hollow Pipe Plugs, Stripper Bolts
Square Head Set Screws

Strong, Carlisle & Hammond Company • Cleveland, Ohio

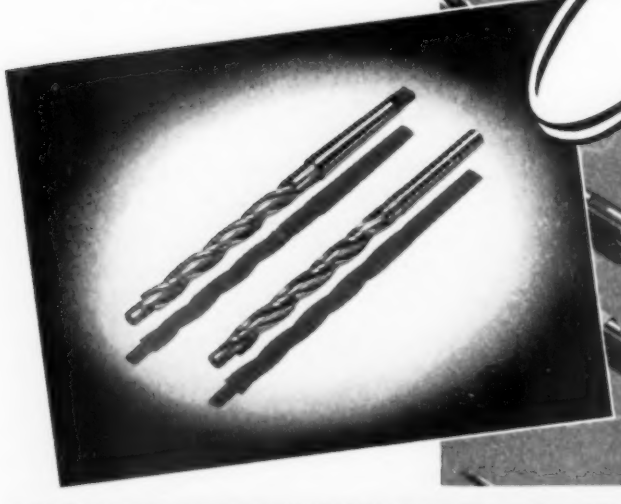
Mac-its

PRONOUNCED "MACK-IT"

4331

TOOLS THAT
• CUT FASTER
• LAST LONGER

High Speed End Mills · Continuous Pilot Counterbores · Spiral Fluted Chucking Reamers



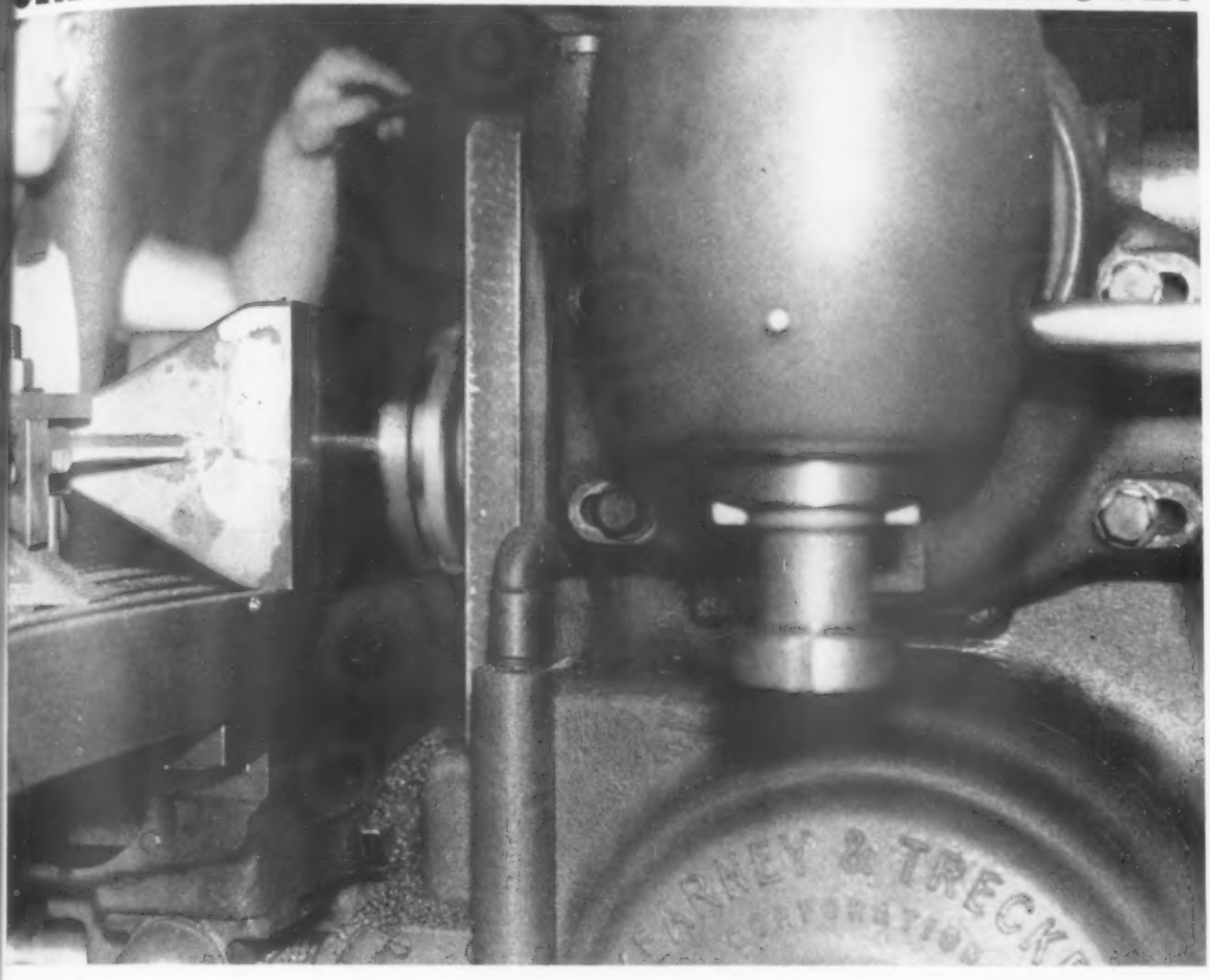
PUTNAM HI-SPEED
Continuous Pilot
COUNTERBORES

Counterbores that provide exceptional tool economy! Almost the entire tool can be utilized as the pilot extends without interruption through the entire fluted portion. As the cutter flutes are ground back due to wear, the pilot head can be cut off to any desired length. A perfect pilot head is always exposed. With effortless feeding, Putnam Continuous-Pilot Counterbores cut rapidly, smoothly and accurately . . . producing long spiralling chips rather than small metal particles. Write for full details.

ARMY E NAVY
AWARDED AUG. 13, 1942

PUTNAM TOOL COMPANY
2987 Charlevoix Avenue • Detroit 7, Michigan

GRINDER-LIKE SURFACE AT 30" A MINUTE!



Note the mirror-like surface produced by a Grayson 6½" Face Mill machining this hard Meehanite casting. The job here was stepped up from 4½ minutes per part to better than ⅔ of a minute per part— more than 7 parts to 1! The number of parts per grinding of the cutter was triple that obtainable before.

GRAYSON STANDARD CARBIDE CUTTERS

INCREASE YOUR PRODUCTION NOW — WHEN REQUIREMENTS ARE ACUTE!

The Grayson Manufacturing Company makes nothing but cemented carbide milling cutters — consequently it has an extensive technical knowledge of this highly specialized field. It is the first company to manufacture a *standard* line of solid-body (Meehanite) carbide cutters. Draw upon our valuable experience and background. Standard face mills, half-side mills, staggered-tooth mills, side mills and slotting mills are available in most cases for delivery within five days of your order.

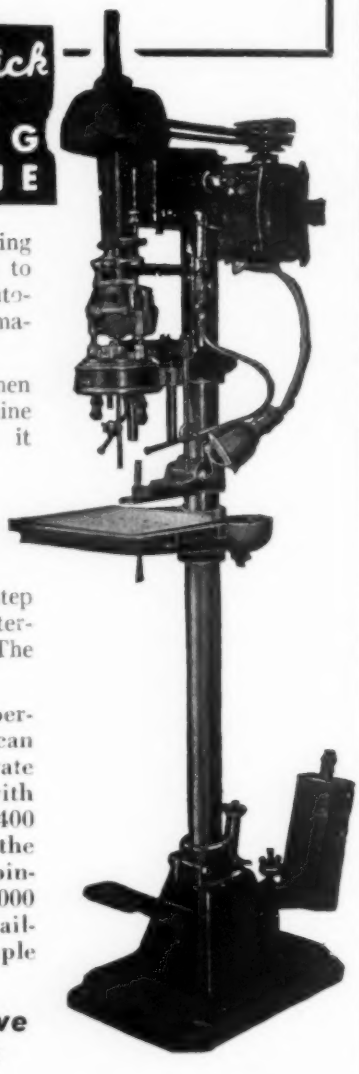
U. S. AND BRITISH PATENTS PENDING

Grayson Manufacturing Company

FACTORY AT MONROVIA, CALIFORNIA

YOU GET THE BENEFIT OF 25 YEARS' SPECIALIZATION IN MACHINE TAPPING... *in the*

Ettco-Emrick
FOOT-OPERATED
TAPPING MACHINE



The Ettco-Emrick Tapping Machine comes as close to being a fool-proof, automatic tapper as any machine can be.

Designed and built by men who have made machine tapping their lifework, it embodies all the skill and sensitivity that machine tapping ordinarily requires. All the operator has to do is feed the work and step on the delicately counterbalanced foot pedal. The machine does the rest.

That's why unskilled operators, men or girls, can give you fast, accurate tapping production with this machine—up to 2400 holes per hour with the machine's standard 2-spindle head—and up to 12,000 holes per hour with available Ettco-Emrick Multiple Spindle Heads.

These Bulletins Give You Full Details

BULLETIN No. 4
Covers the Tapping Machine

BULLETIN No. 3
Covers the Multiple Heads

Copies Mailed on Request.
Write for them today.

IMPORTANT

Recommendations on the best way to handle specific tapping jobs are always available to users of Ettco-Emrick equipment.

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn 6, N. Y.

Detroit • Chicago

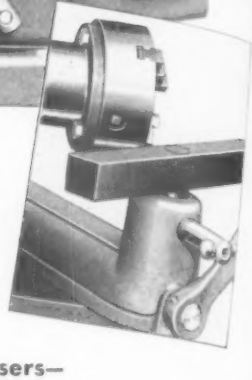
The Famous Ettco-Emrick **DRILL CHUCKS • TAP HOLDING CHUCKS**
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

Presenting REYNOLDS *New* POLISHING UNIT

Illustrated here is standard Motor Driven Bench Model.

Moderately Priced.

Showing Chuck Attachment.



Reynolds New Polishing Unit offers the following outstanding features to users—

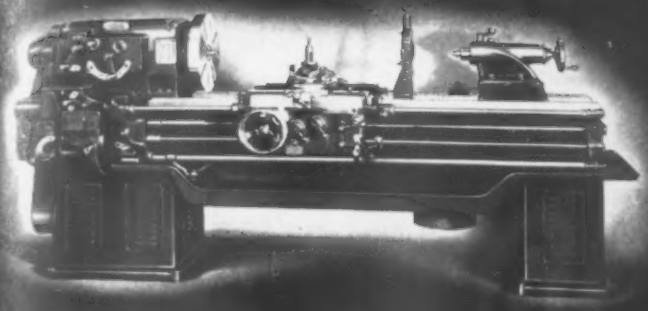
- 1" Collet capacity with 1" hollow spindle clear through.
- Uses any standard motor (not a special built-in motor).
- Has 4-step V-Belt drive.
- Speed range
  with 1725 RPM motor – 1725-900-750-600 RPM
  with 1200 RPM motor – 1200-750-600-450 RPM
  with 3450 RPM motor – 3450-1800-1500-1200 RPM
  (Note: You can purchase machine less motor and use any ½ H. P. motor available in your shop)
- Single lever control, starts–stops–applies brake, opens and closes collet. (Note: spindle may be stopped to inspect work without disturbing setting of piece held in collet.)
- Collets #5C Rivett: a popular size which many plants already have. This same Collet is used on South Bend 16" and 10" lathes.
- Has threaded nose spindle for use of 5" 3 jaw chuck (supplied as an extra).
- Ball bearing spindle assembly.

Write, Wire or Phone Reynolds Machinery Company, Providence, R. I., for further details.

REYNOLDS
MACHINERY CO.

211 EDDY STREET PROVIDENCE, R. I.

Sidney 16 Speed Group



Sidney 16 speed lathes are built in a wide range of capacities from 14" to 36".

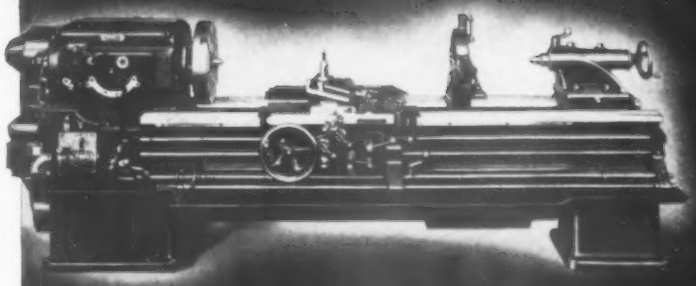
All of these 16 speed models feature continuous tooth Herringbone gearing not only well known but recognized for the greater strength and smoother action resulting from greater tooth contact.

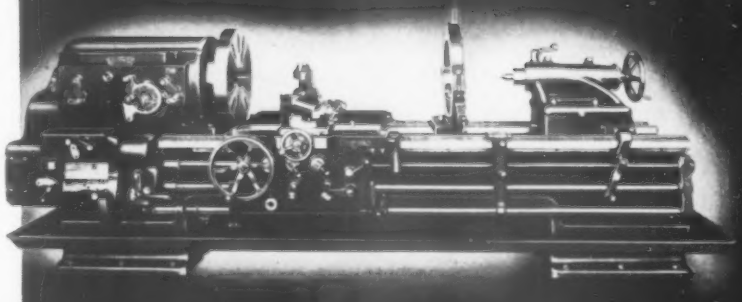
Sidney continuous tooth Herringbone gears are generated and lapped in our own plant to assure the utmost accuracy and smoothest possible finish.

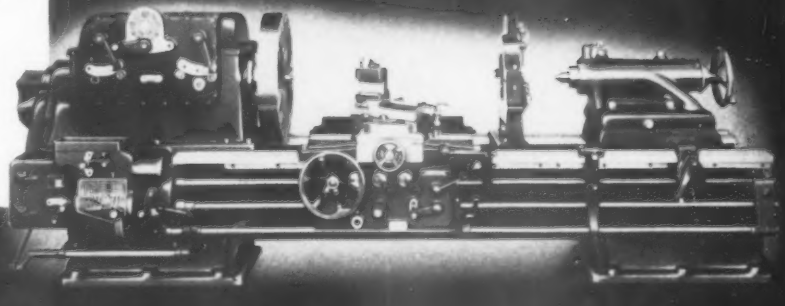
This gearing not only affords greater, smoother power on all sizes but results in highly finished, accurate work free of all tooth marks.

The Headstock is particularly quiet in operation with both spindle and intermediate shaft supported by a center bearing. Internal and external gear tooth clutches operating on multiple spline shafts reduce backlash to a minimum and permit of easy engagement.

For power, speed and continued accuracy Sidney Lathes offer the utmost in dependable lathe performance. Bulletins available.







The SIDNEY MACHINE TOOL Company

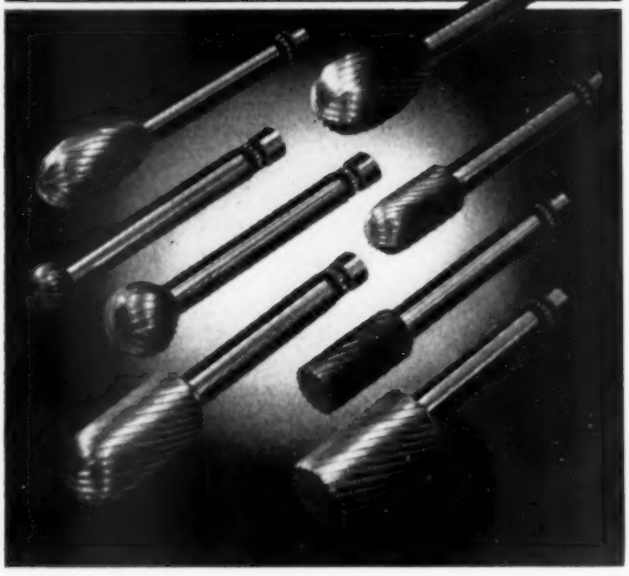
Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

For the First Time!

CEMENTED-CARBIDE BURRING TOOLS

(ROTARY FILES)



for

FASTER, MORE EFFICIENT FINISHING

***with* LESS REPLACEMENT**

—LESS SHARPENING

CARBURS—the first cemented-carbide burring tools (rotary files) ever to be produced . . . the result of five years of intensive research and development work in the grinding and forming of cemented carbide! These new tools have cutting teeth ground from the solid.

From the results of exhaustive tests conducted in actual production, and in the aircraft industry in particular, it has been proved that Carburs offer at least fifty times the tool life of high speed steel burring tools. Providing a sharp cutting edge over a long period of time, these tools reduce burring time per part and generally increase efficiency in burring operations in all types of production.

Many other advantages are assured by the use of Carburs. Because of their wear-resistance, less replacement is necessary and inventories of burring tools can be reduced considerably. Tool sharpening is reduced in proportion to the life of the tool. Carburs can be run at much higher speeds than have been possible with steel tools—another factor in reduction of finishing time.

WRITE FOR COMPLETE DETAILS

CARBUR INCORPORATED

LINCOLN PARK 25, MICHIGAN

Positive, analytical gaging of precision bores

The MODERN method of gaging precision bores to fractions of .0001"

Patented Expanding Internal Gage

Sizes: ¼" to 7" dia. and larger

Bench inspectors, machine operators, and final inspectors all use Comtorplug with equal satisfaction. Accuracy of results is assured by automatic features of self-alignment and self-centering, giving positive 2-point gaging. Trainees master this gage very quickly. It ANALYZES a hole, showing size, front or back taper, out-of-round, bell mouth, barrel shape, etc. Widely used on airplane, ordnance and industrial precision items.

Request Bulletin 20

THE COMTOR CO.

70 Rumford Avenue

Waltham, Mass.

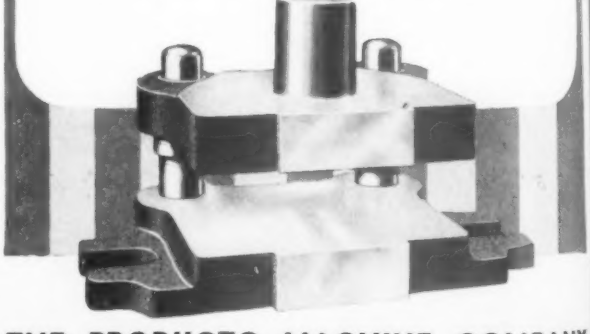
★ ★ ★ ★ ★

PRODUCTO DIE SETS

To help speed up production of tools for war production in all parts of the Country Producto Die Sets are available for shipment from our two factories mentioned below. Also, Die Supply Company, 4747 Hough Avenue, Cleveland, Ohio.

Pacific Coast users will find stock of Die Sets and Accessories at Jamison Steel Corporation, San Francisco and Los Angeles.

Our No. 9 Die Set Catalog gives complete engineering information on Die Sets and Die Makers' Accessories.



THE PRODUCTO MACHINE COMPANY

940 HOUSATONIC AVE., BRIDGEPORT, CONN.

3017 MEDBURY, DETROIT, MICH.

THE LONG LIFE . . . THE ACCURACY *of these Special Cutting Tools*

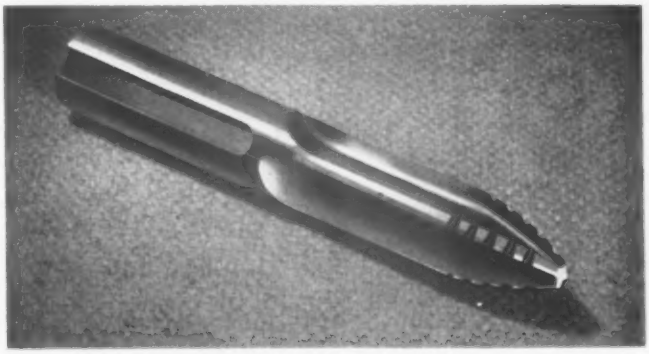
Are Helping to Speed Production of GUNS and SHELLS

Some of the most unusual and "difficult to produce" high speed steel cutting tools have been and are being manufactured by Morse Tool Company.

Among the many special tools produced by this company are various types of reamers such as those pictured here. Other Morse Tool products include special milling and form relieved cutters, as well as complete lines of standard tools.

If your present needs call for high speed cutting tools made exactly to the tool design, dimensions and tolerances shown on your drawings, Morse Tool Company can meet your requirements. Today, and in your post-war production, the experience of this company can prove invaluable in helping you to reduce costs and get greater efficiency in your cutting operations.

A combination drill and step reamer in which the flutes extend for the full length of the tool. As cutting edges become worn, the flutes can be cut back, providing the tool with extremely long life.



A reamer used in shell manufacture. This tool has a special lubricating and chip removal feature. Lubricant comes through a hole in the center of the tool and emerges from holes at end, forcing chips back and preventing packing or clogging in cutting operations.

Morse Tool Company

116 E. GOLDENGATE ST.
DETROIT • MICHIGAN

Special
HIGH SPEED STEEL
CUTTING TOOLS
A mature all inclusive organization devoted to the designing and manufacture of special form, milling and all types of metal working tools . . . Right here in the home of high speed precision production, we have kept pace, and anticipated many of the requirements of this kind of tooling . . . Send for new sixty page catalog.
6906 KINGSLEY – DEARBORN, MICHIGAN
Established in nineteen hundred and thirty

Let Buhr PATENT solve your special drilling problems with multiple spindle heads like this

28 - SPINDLE BUHR INDEX DRILLING and REAMING HEAD

- Vertical adjustment in spindles to lengthen drills.
- Group of ten spindles, index eighteen degrees, to countersink holes in mating part.
- Oil pump for positive lubrication.
- For drilling, reaming and countersinking all holes in wheel hubs.

BUHR MACHINE TOOL COMPANY

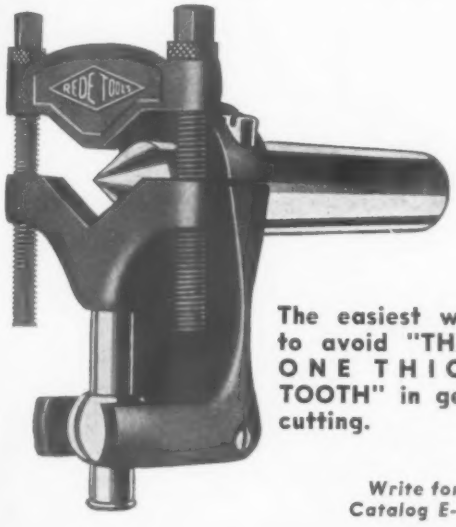
833 Green St., Ann Arbor, Michigan

SPECIALISTS IN MULTIPLE SPINDLE DRILLING, BORING, REAMING AND TAPPING EQUIPMENT

ACCURATE SPACING ASSURED

with the

RED-E MILLING MACHINE DOG



The easiest way to avoid "THAT ONE THICK TOOTH" in gear cutting.

Write for Catalog E-42

THE READY TOOL COMPANY

585 IRANISTAN AVE.

BRIDGEPORT CONN.

DOUGLAS PRECISION SLOTTER

Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.
7" TO 10" STROKE
DOUGLAS
PROMPT DELIVERY

DOUGLAS MACHINERY CO. INC.

150 BROADWAY NEW YORK, N. Y.

Thousands of Man Hours SAVED Every Day with "UNIVERSAL" 3 WAY ANGLE-SET VISES

In tool rooms and machine shops, highly paid operators no longer waste precious minutes searching for clamps, bolts, washers, and parallel strips to rig up jobs.

They quickly clamp the work in a "Universal" 3-Way Angle-Set Vise, adjust to the angle wanted and get the job going.

Even green workers produce satisfactory angle-set machining with the "Universal" 3-Way Vise.

Fully portable. Work clamped in the "Universal" Vise can be moved from machine to machine without changing the angle of the set-up. Ruggedly engineered to stand up under heavy cuts or a production load.

FREE Drawings of 12 Job Set-Ups.

Get the pictures that tell the story. Learn the facts about this Vise that is proving its worth every day in the nation's most progressive shops and plants. Thousands have written for the complete, illustrated folder that's yours FREE. Mail the Coupon Today.

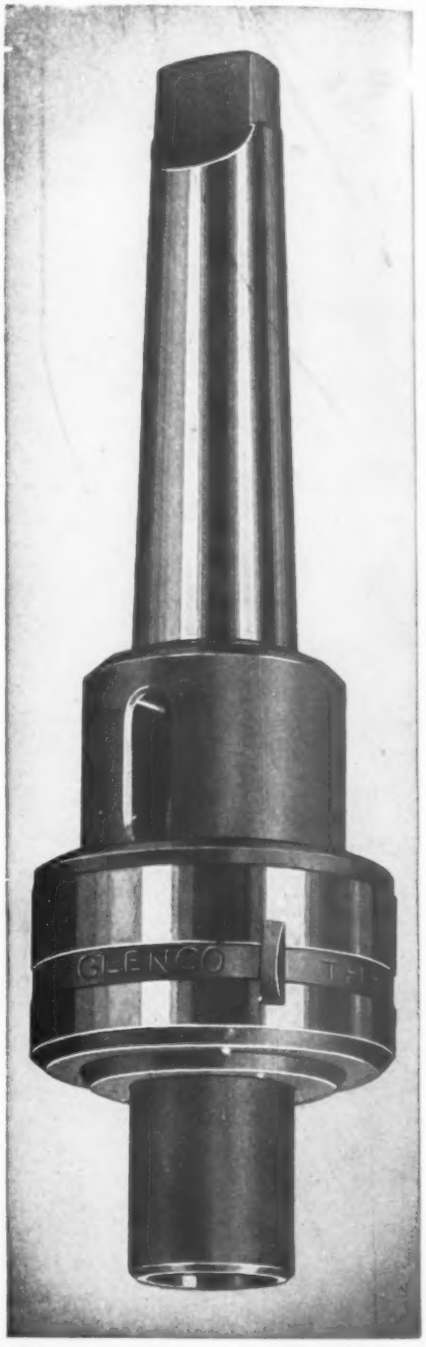
UNIVERSAL VISE & TOOL COMPANY

131 Main Street Parma, Michigan

GLENCO

FLOATING TOOLHOLDER

Corrects Machine Tool Misalignment By Producing TRUE and ACCURATE Holes



Also Manufacturers of

Milling Tools

FLOATING HOLDERS
SPOTFACERS
COUNTERSINKS
REAMERS
COUNTERBORERS
LIVE CENTERS
SLEEVES
TAP CHUCKS
DRILL CHUCKS
ADJUSTABLE ADAPTERS
ADJUSTABLE EXTENSION ASSEMBLIES
QUICK CHANGE CHUCKS
EXTENSION SOCKETS
SPACING COLLARS
ARBORS
END MILLS
WOODRUFF CUTTERS
CORE DRILLS

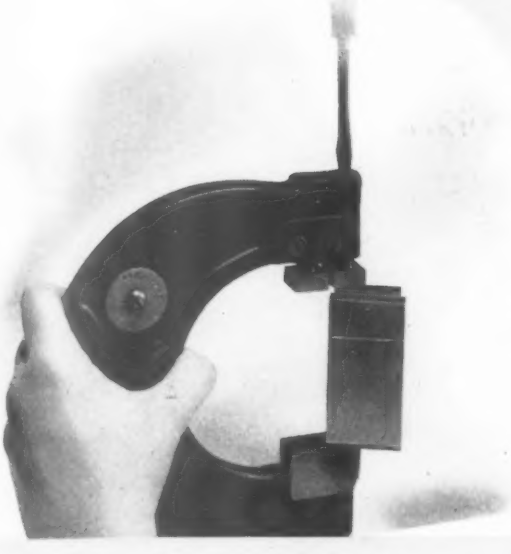
THE J. C. GLENZER CO.

DETROIT MICHIGAN

ANOTHER LINCOLN PARK *"First"*

The Wear-Resistance of Cemented-Carbides

NOW AVAILABLE IN GAGE BLOCKS



Carblox—Lincoln Park's new cemented-carbide gage blocks—provide the means to greatly reduce the wear error in gage block use. Sets of gage blocks made of other materials, and which are used continuously as master or working sets for comparative measurements, wear rapidly and will show a loss in size of a few millionths to as much as several ten thousandths of an inch within a short time. Carblox will retain their accurate size within the allowable wear tolerance at least fifty times longer than steel blocks used for the same purpose.

The greatest wear factor in the use of any gage blocks is caused by abrasion on the ends of the build-up. A relatively small amount of wear is caused by the wringing together of the blocks. Carblox used on each end of a build-up will act as protective anvils and prevent wear on the less wear-resistant steel blocks.

Carblox are practically non-magnetic and are highly resistant to rust or corrosion. Their high cohesive factor facilitates the wringing of thin blocks and eliminates the difficulties now encountered in wringing thin steel blocks.

Carblox, with their high wear resistance, will maintain their original accuracy for a long period of time . . . will largely eliminate the customary necessity of checking blocks . . . will greatly increase the usable accurate life of all gage block sets . . . will reduce to a minimum scrap or rejections that might result from the use of worn gage blocks.

WRITE FOR COMPLETE DETAILS

CARBLOX

CARBLOX ARE SUPPLIED 'N THE FOLLOWING BUILD-UP RANGES

Carblox are furnished to "A" accuracy (.000004") and "B" accuracy (.000008") as a series of wear blocks to be used on the ends of a gage block build-up or as individual blocks when a build-up is not required.

The fourteen block set consists of two .050", two .100" and one each of .05005", .0501", .0502", .0503", .0504", .0505", .0506", .0507", .0508", and .0509". The .050" and .100" blocks are also furnished in boxes in pairs as well as in combination—that is two .050" blocks and two .100" blocks in a box.

The full build-up range of the standard 81-piece set of gage blocks is available when Carblox are used. For example in a .4051" build-up, one .050" Carblox and one .0501" Carblox would be used with one ordinary .200" and one ordinary .105" gage block. The half-tenth (.05005") Carblox further supplements regular gage block sets.

ARMY E NAVY

LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

NEW EQUIPMENT

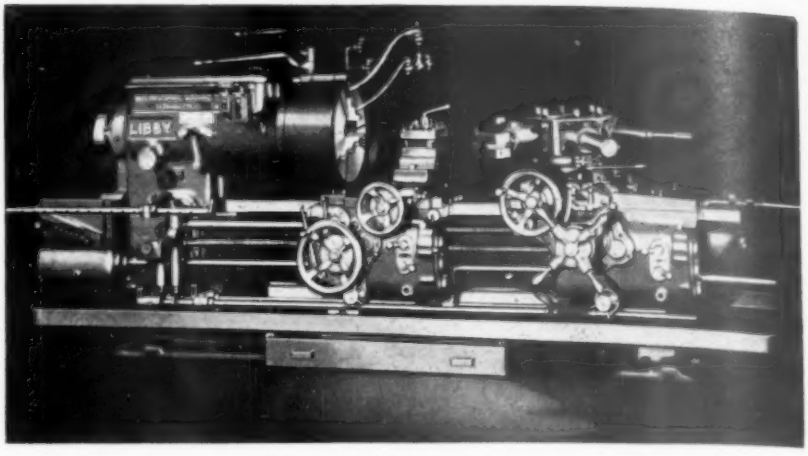
T. M. REG. U. S. PAT. OFF.

• Materials + Processing •

HEAVY DUTY TURRET LATHE (L40)

Libby Division of International Machine Tool Corporation has announced a new line of heavy duty turret lathes known as Type H. Five standard sizes with different size spindle bores to accommodate various classes of work are available.

Principal features outlined for the lathe are alloy semi-steel bed and headstock cast in one piece, hardened steel ways dovetailed into the bed casting without bolts or screws, simultaneous control of clutch and spindle brake, 8 spindle speeds with 8 more possible by using two speed 1800 rpm. motor, antifriction ball and roller bearings, hollow-bored spindle, combination splash and automatic force feed lubrication system, built-in coolant system, specially designed heavy chucks, and combination cone and disc clutch.



Libby Type H Heavy Duty Lathe

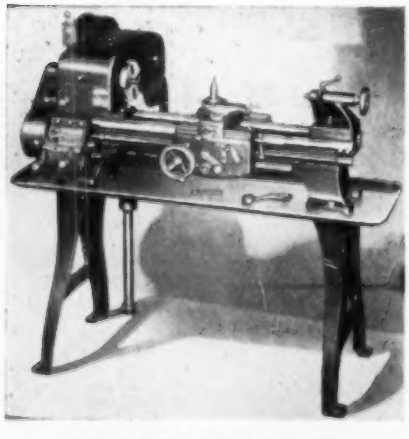
QUICK CHANGE GEAR LATHE (L41)

The new Logan 820 Quick Change Gear Lathe is specially designed for operations where frequent changes in feeds must be made, according to the manufacturer, Logan Engineering Company. The gear box is simple in operation, so that even inexperienced operators have no difficulty, company spokesmen say. Features listed for the machine are an automatic apron, an additional longitudinal drive operating from half nuts on the lead screw, a safety device which makes it impossible to engage both drives at the same time, and legible index plate to guide the operator in gear changing.

The gear box provides 48 threads and feeds in either direction to the carriage. Screw threads from 8 to 224 per inch are available by simple adjustment of two levers. Additional threads from four to seven per inch are possible by changing from the 24 tooth stud gear to the 48 tooth gear provided with the machine.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.



Logan Quick Change Lathe

ALL-HYDRAULIC FOLLOWER ATTACHMENT (L42)

The Turchan Follower Machine Company, Detroit, announces an all-hydraulic duplicating attachment designed to increase production by eliminating necessity of individual machining.

The follower is built for one, two, or three dimensional operation, according to the maker, and is easily attached to any standard lathe, planer, grinder, shaper, or mill. Also, it is stated that it does not interfere with the machine to which it is attached.

LUBRICATING SYSTEM (L43)

All bearings on machine tools, regardless of location are assured of positive lubrication if the "Multival" system of machine lubrication is used, according to the manufacturer, the Farval Corporation. A manual or portable power-operated gun, which serves as a central pump, delivers oil or grease to the distributing blocks.

The unit consists of multiple valve blocks, each serving from two to ten bearings, lubricant lines leading to individual points, and fittings adaptable to most bearing connections. Shop maintenance crews can install the system, the maker states.

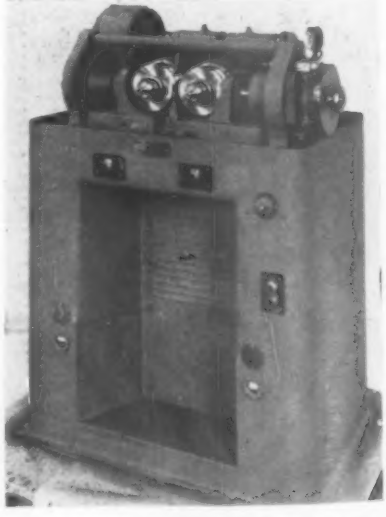
PRECISION THREAD ROLLING MACHINE (L44)

An entirely new principle is used in its new thread rolling machine, according to Watson-Flagg Machine Company, Inc. The machine, which rolls outside threads by the cold forming process, carries two large steel rolls, bearing on their faces the profile, pitch and helix angle of the desired thread. The rolls are pressed by hydraulic pressure into the workstock, previously machined to pitch diameter, and all threads are rolled simultaneously. The workpiece, resting on a blade between the revolving rolls, turns on its axis. When the required thread pitch diameter is obtained, an automatic sizing control releases the rolls and returns them to starting position.

Accurate threads of standards required by aircraft and other precision jobs can be rolled on high tensile strength steels, light metals, hollow bodies, tubes, shafts, or spindles, according to the manufacturer. Capacity depends on the metal used. For high tensile strength steels the diameter ranges from ⅛" to 1"; for lower strength materials diameters run up to 4½". Length of thread is up to 2-¾".

(Continued on page 166)

Thread Rolling Machine



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New catalogs — bulletins listed in this issue.

2:
Additional information or bulletins relative to new equipment — new materials or new processes.

3:
When answering advertisements, specific information on problems or company representative's call.

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail.

Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described.

In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

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for requesting new catalogs and bulletins listed in this issue.

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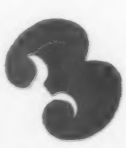

USE THIS CARD

when answering advertisements, to obtain specific information on problems, or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, SEPTEMBER 1943

Write in square, number of item describing one catalog wanted ➔ ☐

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THE TOOL ENGINEER, SEPTEMBER 1943

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2

Request for additional information and catalogs covering
NEW EQUIPMENT
MATERIALS
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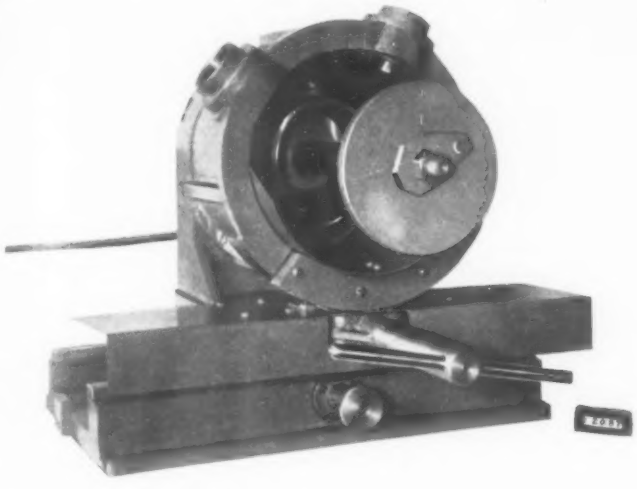
3

ANSWERING ADVERTISEMENTS
Requesting:
LITERATURE
REPRESENTATIVE TO CALL

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley Ave. Detroit, Michigan



A DOUBLE INDEXING FIXTURE TO MACHINE PORTHOLES IN CYLINDER BARREL UNDER TWO SPINDLE GANG DRILL. CYLINDER ROTATES WHILE MOVING HORIZONTALLY.

-DESIGNERS-
-BUILDERS-

SPECIALIZING IN
ALL TYPES OF
HOLDING FIXTURES
FOR MACHINE SHOP
PRODUCTION

BUILDERS OF STANDARD DRILL JIGS AND FIXTURE LOCKS

ASK FOR CATALOG 941

J. K. SMIT & SONS

157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

INDUSTRIAL DIAMOND TOOLS

FLAME HARDENING MACHINE (L45)

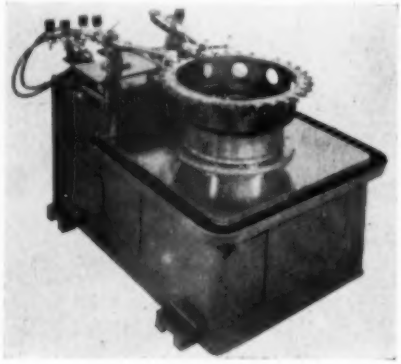
Hydraulic Machinery, Inc., has placed on the market a bench model flame hardening machine for handling small parts. According to the maker, different

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

shapes and sizes may be hardened by revising the multiple duty holder and changing the tips of the burners.

In operation, an automatic switch causes the solenoid to retract after the time cycle has elapsed, dropping the part into the quenching medium direct-



Flame Hardener

ly under the fixture, making the entire heat-quench operation automatic. The machine is hydraulically operated and electrically controlled.

COMPOSITE ALLOY STEEL (L46)

Development of a composite steel makes possible savings of from 50 to 80 per cent per tool on high speed and other alloy steels, according to the manufacturer, the Jessop Steel Company, Washington, Pa.

The steel consists of a section of alloy steel permanently bonded to a backing of mild steel. Critical alloys thus are saved, but performance of the solid alloy metal on the inserted section is not impaired, the manufacturer states. The proportions of the alloy section are controllable. In addition to tool steel, die section and stainless-clad steels also are available.

POWER RIVET GUN (L47)

A simplified and improved model of its power rivet gun is announced by Cherry Rivet Company, Los Angeles, Cal.

Called the G 15, the gun is designed for high speed blind riveting in double-surfaced structures where only one side of the work is accessible. The manufacturer says the tool will install 1600 rivets per hour in the hands of a skilled operator.

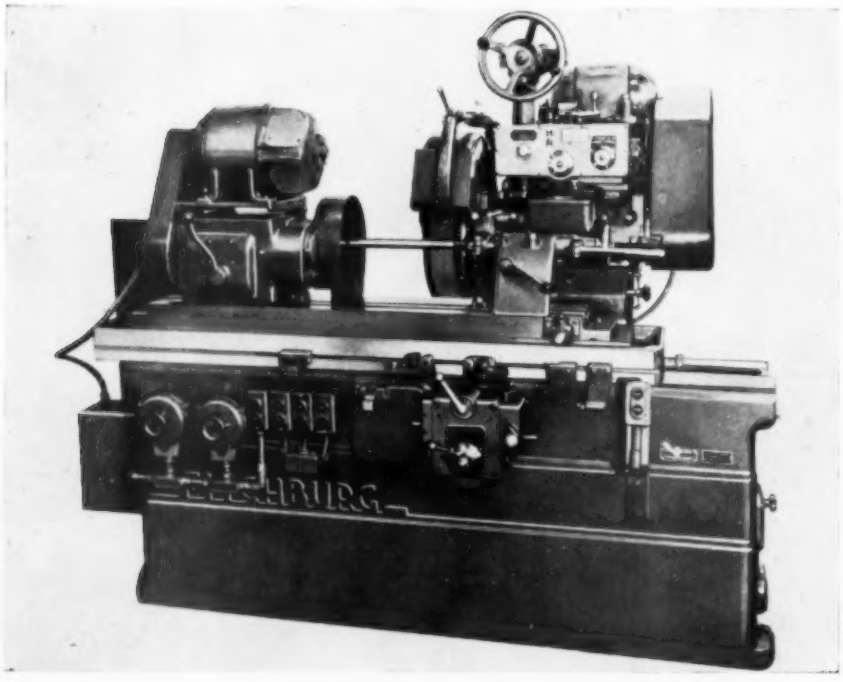
Design has been simplified to make fewer parts in the power linkage. Hose connections are for standard one-fourth inch lines, and the gun operates on 75 to 100 pounds P. S. I. pressure. Three interchangeable heads handle standard rivet diameters of $\frac{1}{8}$, $\frac{5}{32}$, and $\frac{3}{16}$ inches, either hollow or self plugging types.

AUTOMATIC GRINDER (L48)

A new 10" cylindrical automatic precision grinder designed to handle a wide range of different type jobs, has been introduced by the Fitchburg Grinding Machine Corporation.

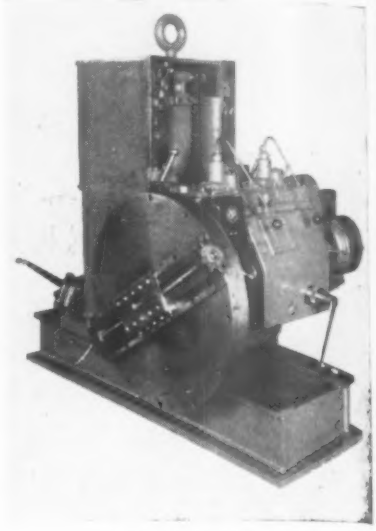
The machine operates on a completely automatic cycle—rapid traverse to the work, correct feed, grinding dwell and rapid return—after being started by a push button. Feed movements may be controlled within .0001", according to the manufacturer. After setting the grinder in motion, the operator is free to tend another machine. The company also makes a 6" automatic grinder.

Fitchburg 10-inch Cylindrical Automatic Grinder



PORTABLE BORING AND FACING MACHINE (L49)

Designed for boring, facing, and turning operations on work pieces too large or inaccessible to be machined on regular tools, a new portable machine has been introduced by the General Engineering and Manufacturing Company. The machine can be easily taken



Portable Miller

to such work pieces as lathe beds, press frames, bed plates, pipe headers, valves, and similar jobs, and will readily machine them on the spot, according to the maker. The device also may be used as a stationary unit.

The machine is built of heavy steel and is mounted on a base designed to allow travel by spindle action for 36". Seven spindle speeds are available ranging from 7 to 100 rpm. Another feature cited by the company is instantaneous change-over from boring to facing operations.

NEW MOTORS TOTALLY ENCLOSED (L50)

The Motor Division of the General Electric Company, Schenectady, New York, recently announced a line of totally enclosed motors. The manufacturer states that the new motors are specially designed for use under conditions where abrasives, chemicals or excessive dirt are encountered.

They are available in both the polyphase, 60-cycle, induction type and the singe phase, 60-cycle, capacitor type. The polyphase motors are furnished in frame sizes 203 to 225 while the single-phase are furnished in frame sizes 203 and 204.

NEW GRINDER FEED TABLE (L51)

A new "In-Out" feed table has been developed by Porter Cable Machine Company as an accessory for its G-4 belt-type grinder. The device, which is comparatively inexpensive, is designed to insure speedier and more accurate surfacing of discs, squares, and other

(Continued on page 168)

...cut at higher speeds

... hold cutting edges longer

...produce more pieces between grinds

... reduce grinding and re-tooling time

You're "in the chips" more ways than one, when you use TECO Cemented Carbide. Because it stays on the job longer between grinds, TECO Carbide spends more productive time removing metal—less down time for re-tooling. Consequently, you produce more pieces per machine, per day.

This greater resistance to wear and breakage comes from the rigidly controlled density, hardness and uniformity of TECO Cemented Carbide. Available in grades, styles and sizes for practically every machining operation. Let us know your needs. Write for detailed catalog.

TUNGSTEN ELECTRIC CORPORATION • 570 39th Street, Union City, N. J.

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CEMENTED CARBIDE**

small parts, according to the manufacturer.

The unit consists of two tables, placed one on each side of the belt and both adjustable to the grit level. These allow the stock to be fed to the belt on a perfectly flat plane, avoiding the possibility of nicking or grinding out of parallel. A rail holds the stock against the pressure of the belt and can be set to control the amount of grinding within micrometric limits. It can be used by inexperienced operators after a minimum of instruction, says the maker.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

FLEXIBLE INDUCTION HEATING MACHINE (L52)

Ohio Crankshaft Company announces a new small compact induction heating machine, priced within reach of smaller manufacturers whose heat treat needs are limited. The unit also may be used as a utility machine by larger manufacturers.

Called the TOCCO 15 KW Junior, the machine can be adapted to brazing, annealing, heat-treating, heating for forging, and surface-hardening of small

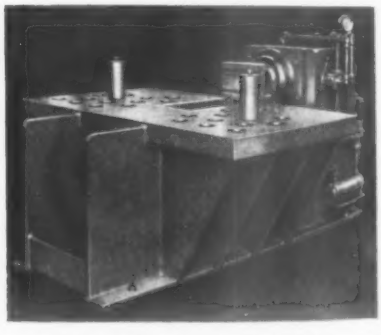
Induction Heating Unit

and medium-sized parts, according to the company. Trained electrical engineers are not required for normal operations.

The machine includes such features as pre-set automatic controls, quenching auxiliaries, transformers, push button controls, water-cooled coils, and a 20 hp. motor generator set to maintain accuracy of heat control.

HYDRAULIC BENDER (L53)

Beatty Machine & Mfg. Company has announced production of a new 25-ton hydraulic bender for pipe bending, straightening, pressing, miscellaneous forming of light structural and welded



Hydraulic Bending Machine

shapes, and light utility use in general metal working plants.

The table of the machine carries 26 holes for location of bending pins in various positions for bending and straightening odd shapes. The ram is 12" wide by 9" high. Maximum operating pressure is 2000 pounds per sq. in. This type press is available in sizes ranging from 35 to 200 tons, according to the company.

BORING BAR (L54)

A new boring bar, used for finishing cuts and especially adapted to boring shoulders and bottoms of holes, has

(Continued on page 170)

Tool Style 11

KENNAMETAL tools increase production without adding men or machines. Because of their superior strength KENNAMETAL tools can be used at heavier feeds than other carbides.

KENNAMETAL often roughs and finishes in one cut . . . it is able to hold its size on long cuts and leaves a smooth finish characteristic of jobs turned, bored, or faced by KENNAMETAL.

KENNAMETAL permits higher cutting speeds and removes more steel per regrind and more steel per tool life than other carbides. Less time spent for regrinding and resetting of tools increases time spent in your shop on actual production.

Write for your copy of the KENNAMETAL Tool Manual which contains complete information about this superior cutting carbide.

KENNAMETAL THE All American CARBIDE

KENNAMETAL Inc.

600 Lloyd Ave., Latrobe, Pa.

Trade Mark Reg. U. S. Pat. Off.

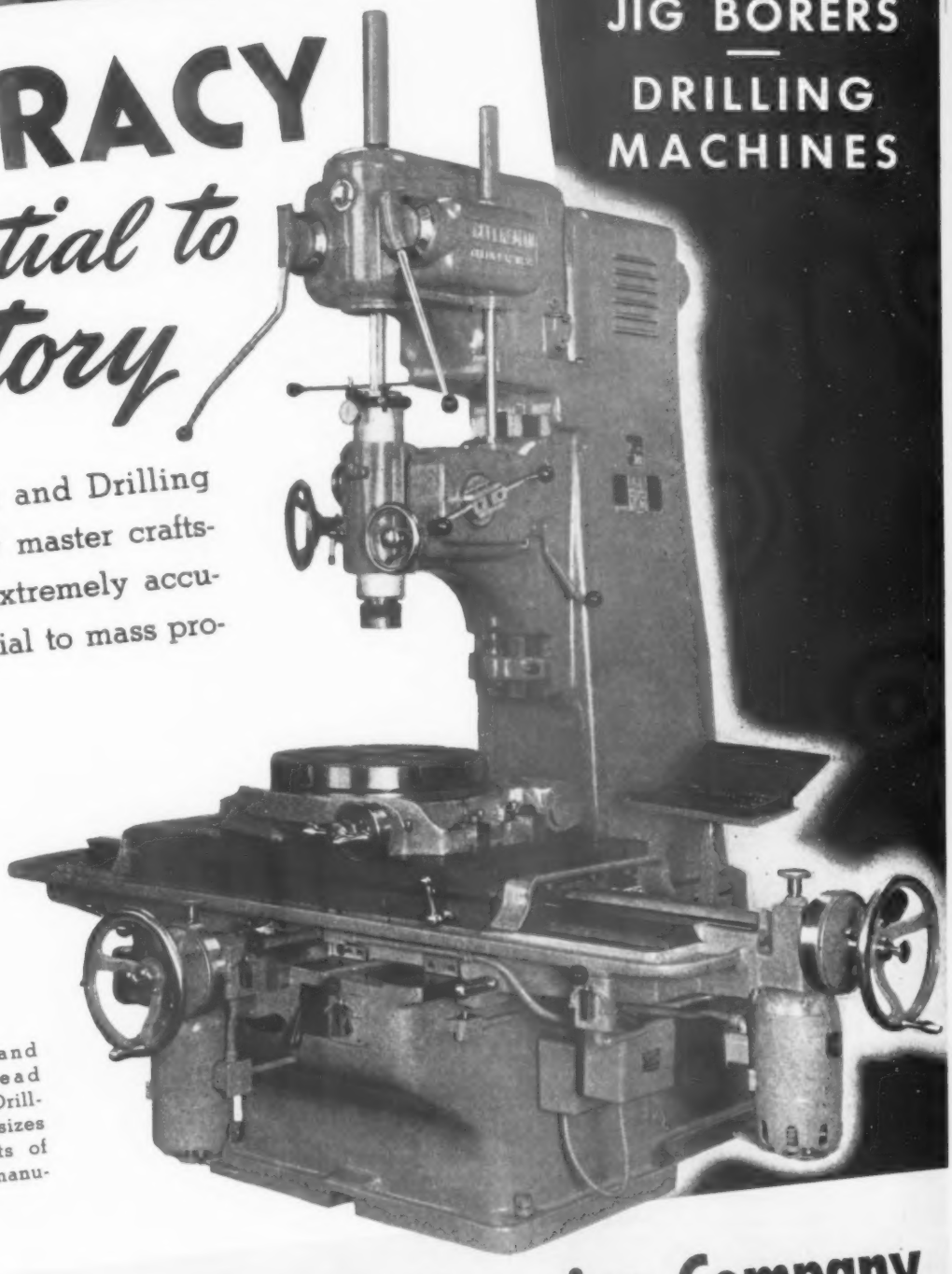
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York (Exclusive of Canada and Great Britain)

CLEEREMAN

JIG BORERS — DRILLING MACHINES

ACCURACY
-essential to Victory

Cleereman Jig Borers and Drilling Machines are built by master craftsmen to perform the extremely accurate machining essential to mass production for victory.



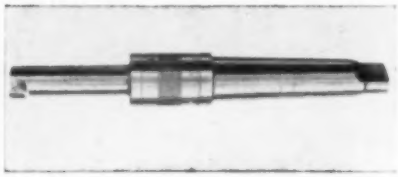
★

Cleereman Jig Borers and *Cleereman* Sliding Head Round, and Box Column Drilling Machines are built in sizes to meet the requirements of tool rooms and general manufacturing shops.

Bryant Machinery & Engineering Company

Sales Division of **Cleereman Machine Tool Co.**

400 W. Madison St. • • Chicago • Ill. • U. S. A.



Boring Bar

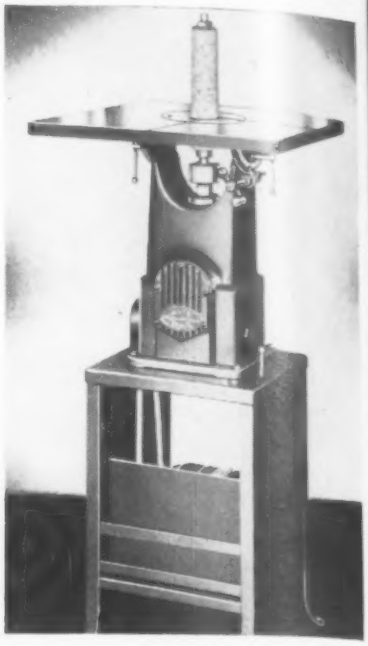
been added by Universal Engineering Company to its line of precision tools.

A blade projects beyond the end of the bar, permitting chips to fall ahead of the bar. The device takes its name —Mikro-lok—from the micrometer adjusting dial within the bar by which the blade can be set and locked to close tolerances. The bars are available with straight and taper shanks and a variety of flanges to fit various machines.

SPINDLE SANDER (L55)

A new, rapid production, oscillating spindle sander, said by the manufacturer to use the smallest diameter abrasive sleeve of any low priced spindle sander, has been introduced by Boice-Crane Company.

The machine, which is portable, sands any degree of bevel up to six inches and can be used for grinding aluminum, masonite, brass, die castings and sheet iron for templates. It also is able to



Oscillating Spindle Sander

sand effectively faces which taper through different slopes at successive cross sections.

The sand drum runs 83 complete ¾" strokes at 2,500 rpm. A 20" by 20" table tilts both ways 45° and is geared for close setting. The crank case is dust proof and leakproof, and bearings are grease packed.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

BROACH SHARPENER (L56)

A new junior broach sharpener has been introduced by Modern Industrial Engineering for the special job of handling small broaches.

The machine is completely motorized

(Continued on page 172)

Small Broach Sharpener

Sutton Patented Diamond Grip Collets take horizontal and rotation thrusts at an angle and hold stock fast with 10% to 15% less locking tension—reducing strain and wear on machine and parts.

With slippage cut to practically zero, machine cycles can be stepped up to tool capacity—you get more pieces per hour.

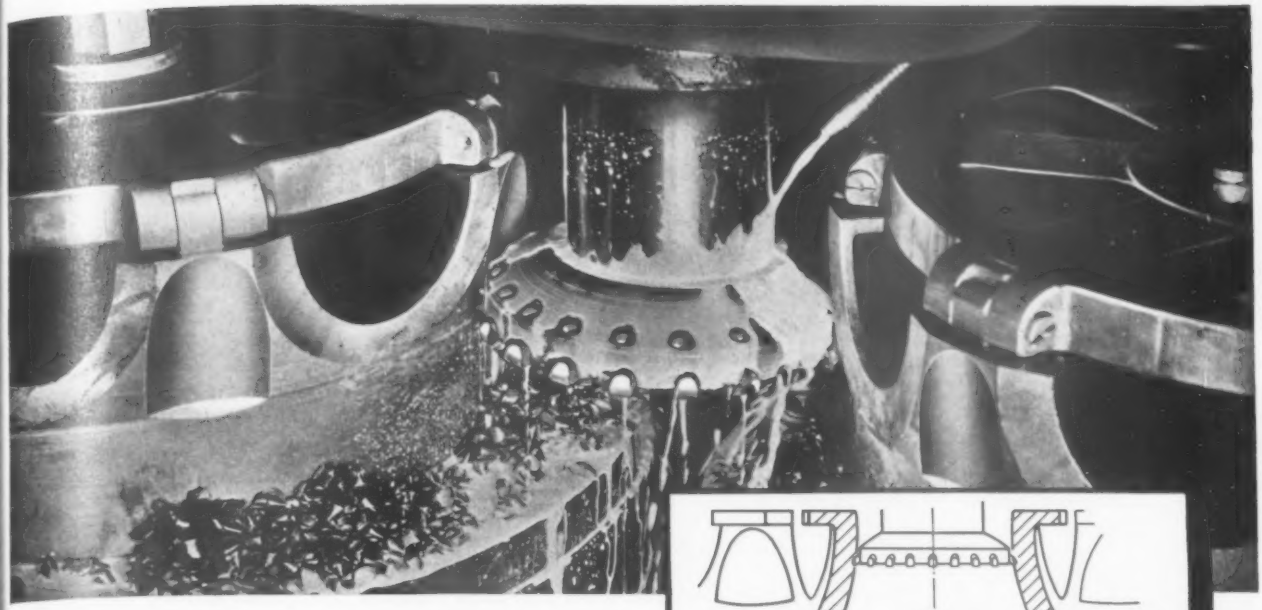
Diamond Grip is self-cleaning . . . does not clog like ordinary, square-cut grip . . . you get less scrap . . . costs no more than ordinary collets.

See our representative or send for Catalog 15

SUTTON TOOL COMPANY

2895 W. Grand Blvd. Detroit 2, Michigan

SUTTON Diamond Grip COLLETS

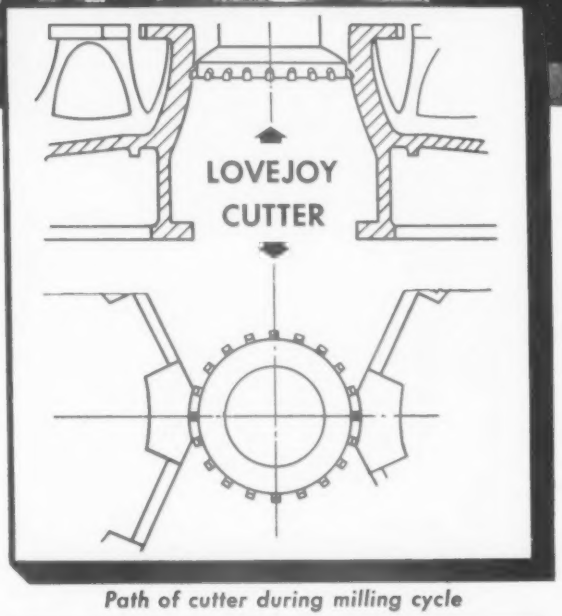


On unusual jobs
Specify LOVEJOY MILLING CUTTERS
For unusually fine results

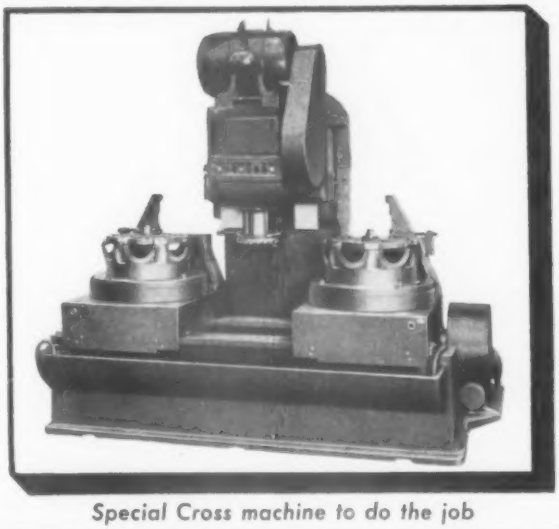
Aircraft engine parts require high production with the finest degree of precision and finish. Thus you usually find Lovejoy milling cutters on jobs of this kind.

The Cross Gear & Machine Co. developed the machine, shown here, for milling unusual shapes in two crankcase parts *in one setting*—Lovejoy designed and built the special milling cutters to do the job.

Call on Lovejoy for special or standard designs that may allow you to "double up" on jobs like the one shown here. Call on Lovejoy for recommendations based on solving thousands of usual and unusual milling problems.



Path of cutter during milling cycle



Special Cross machine to do the job

Send for this general catalog which gives details on the Lovejoy line of precision milling cutters.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U. S. A.

and is equipped with all necessary attachments. Special design care has been taken to protect all working parts from grinding dust, according to the builder. Specifications include high-speed spindle with speeds from 15,000 rpm. down to 4,000 rpm., motor driven headstock with variable speeds, sufficient rigidity to handle high speeds with no vibration or chatter, and capacity to handle broaches up to 8" diameter and 30" between centers.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

COOLANT COOLER *(L57)*

Accurate and automatic temperature control of lubricants and coolants used in machining is possible with use of the "Frostrode" coolant cooler, according to the maker, Frostrode Products. The unit is especially useful for heavy cutting and high pressure grinding jobs, the manufacturer states, but also is adaptable to any other type of operation or machine using coolants.

Single tube evaporator coil construction eliminates possible plugging and subsequent operating troubles, the maker asserts. Another feature pointed out is that the cooler operates independent

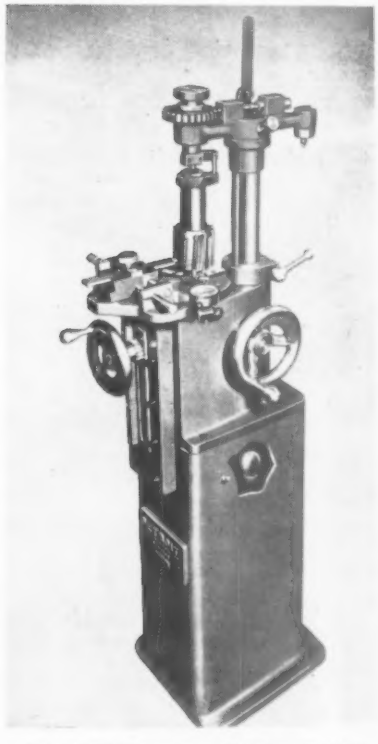
Cooler for Coolants

of water services because of its air-cooled compressors. All that is necessary is to roll the cooler up to the machine, connect into the coolant line, and plug into a convenient outlet. Rated capacity is 18 gallons of coolant a minute when cooled down to 20° F. below room temperature. Any conventional coolant, such as oil, soda, or emulsions, may be used with the unit.

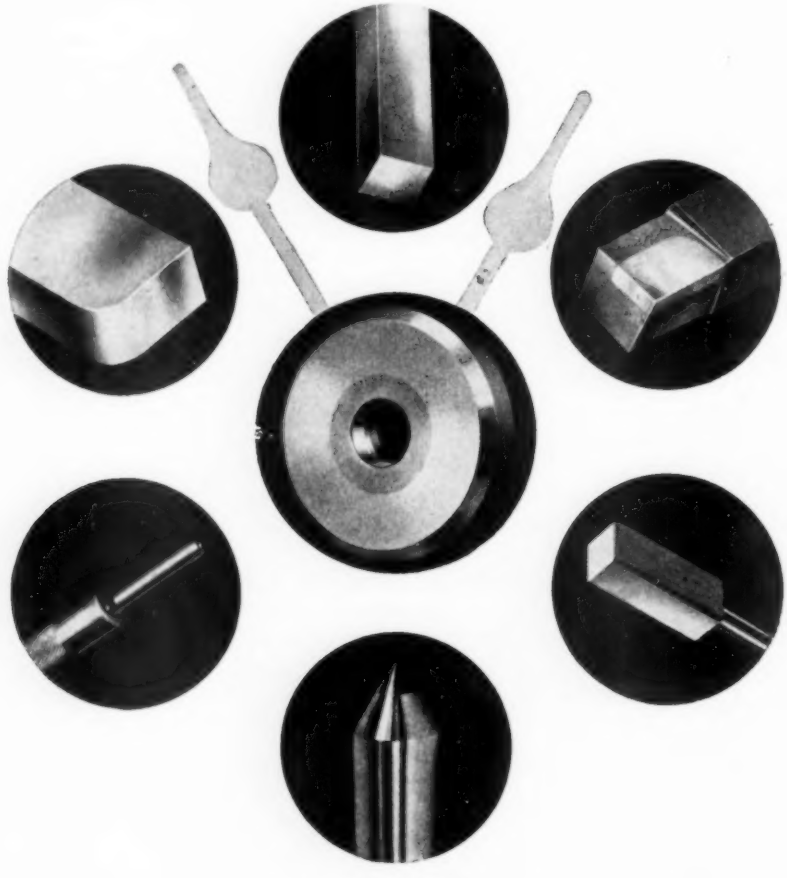
MILLING CUTTER HOOK CHECKER *(L58)*

Rapid and accurate checking of hook or rake angles and flute spacings is the chief feature cited by the Detroit Tap & Tool Company for its new Universal

(Continued on page 174)



Hook Checker for Milling Cutters



WAR-PRODUCTION TOOLS

To speed the day of Victory

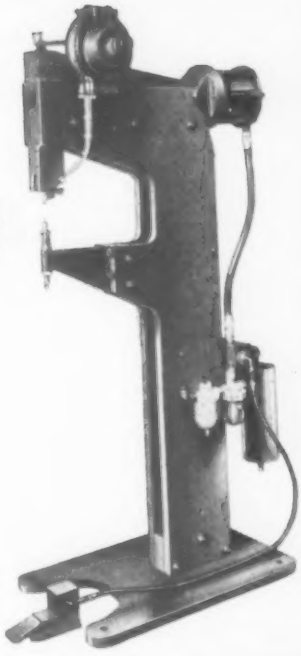
Tamaloy tungsten carbide tools
Speedaloy cutting tools
Tools, dies, lathe centers, hones
Tamaloy carbide blanks.

TUNGSTEN ALLOY MFG. CO.

65 COLDEN STREET, NEWARK 4, N. J. formerly Circle Tip Tool Co.

Automatic Feed Riveting

for AIRCRAFT PRODUCTION!



Designed to handle exclusively aircraft (aluminum alloy riveting) production... this new Air Powered RIVITOR averages 1600 riveted joints per hour... with no manual rivet handling. Combines Air Squeeze action with automatic feeding and setting. Soundly engineered... ruggedly built ... meets today's needs for *speed, accuracy* and *cost-cutting efficiency!* Write for new catalog RP-1.

FOR TOUGH JOBS... SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

Better Performance

in HYDRAULIC POWER MOVEMENT!

Get *maximum* power output and efficiency in hydraulic cylinders... by specifying T-J! Easily and quickly installed. T-J Hydraulic Cylinders avoid excessive pressure losses due to friction ... their advanced design assures that initial high mechanical efficiency is continuously maintained. Available in types and sizes to exert power movement from 1000 to 50,000 lbs. (direct). Write for Bulletin H-40. The Tomkins-Johnson Co., Jackson, Michigan.

hook checker for thread milling cutters.

By aligning the face of the cutter flute with a ground straight edge against an illuminated background, the operator can read the offset distance directly from an integral micrometer barrel, according to the manufacturer.

Any error of flute spacing can be detected on an indicator dial by placing an indicator finger against the cutting face.

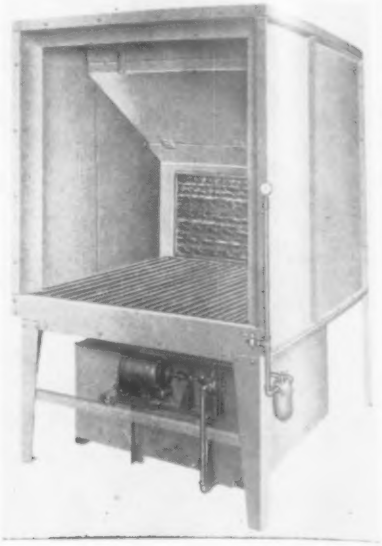
Thread milling cutters from 1-½" to 6½" can be checked on the machine. Cutting faces up to 7" of flute length can be inspected at all points for accuracy and uniformity of grinding.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

DEGREASING SPRAY BOOTH (L59)

Ability to hold solvent loss to the barest minimum is the chief feature of the new DeVilbiss spray-degreasing booth, according to the company. This is especially important in view of present shortages of organic solvents used for degreasing, says the manufacturer. Other advantages cited are special design to insure safety when used with hazardous materials, ability to remove fumes thoroughly, and delivery of a hard-driving spray. The booth is made in 14, 16 and 18 gauge steel and in various sizes.

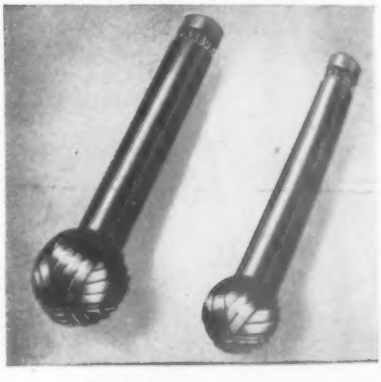


DeVilbiss Degreasing Booth

CEMENTED CARBIDE BURRING TOOLS (L60)

Carbur, Incorporated, has developed and introduced what it claims to be the first cemented-carbide burring tools ever to be produced.

Known as Carburs, the tools have cutting teeth ground from the solid. Heads are firmly attached to steel shanks by a new process. The company states that tests and user reports indicate a tool life of from 50 to 100 times that of high-speed steel burring tools. Another advantage cited for the cemented-carbide tool is that it can be run at higher speeds than is possible with steel tools. At present the tool is available only in ball end types in 3/32" and ½" sizes.

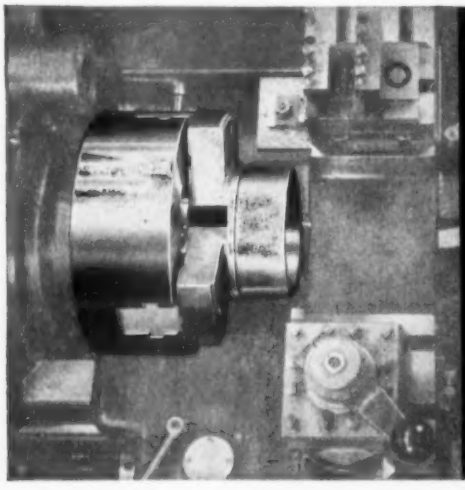


Carbide Burring Tools

TRANSPARENT ENVELOPE (L61)

American Plastic Products has developed a new transparent plastic en-

(Continued on page 176)

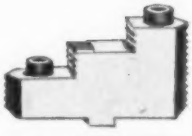


tough HOLDING PROBLEMS easily solved with American Standard Two-Piece Jaws and Soft Blank Top Jaws

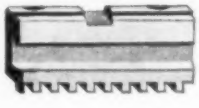
● Jaw equipment exactly fitted to the requirements of an individual part naturally makes it very much easier for operators to work quickly and accurately and is an important factor in repetitive production. Furthermore, jaws can be so arranged that the grip will be in correct relation to tool pressures and in such a manner that already finished surfaces will not be marred.

With chucks equipped with American Standard 2-piece jaws, this is very easily and inexpensively accomplished by the use of soft blank top jaws, individual sets of which can be machined to exactly the right form required for the work to be held. These top jaws are then simply bolted in place on the master jaws remaining in the chuck body and can be quickly changed as required to handle different parts in production on the same machine. This almost entirely eliminates the need for special jaw fixtures, saving time and material, simplifying machine set-up.

Our engineering department is always ready to help you in working out difficult holding problems. Do not hesitate to call on us. The Cushman Chuck Company, Hartford, Conn.



REVERSIBLE TOP JAW



MASTER JAW

SOFT BLANK JAW

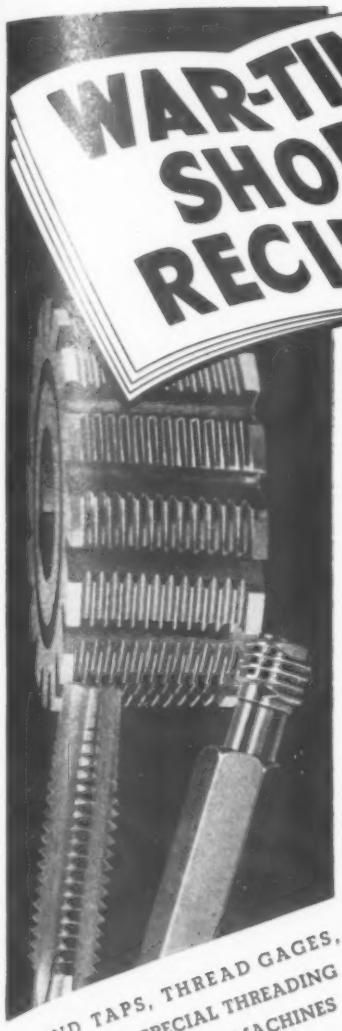
These small "Chuck Check" maintenance cards can be given to operators or put on bulletin boards. They'll help save time, save chucks and reduce spoilage. Ask us to send you some.

CUSHMAN

A World Standard for PRECISION

WAR-TIME SHOP RECIPES

#3 for thread production



GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES

In view of the extreme demand for reconditioning equipment to reduce consumption of taps by war industries, Detroit Tap and Tool Company has put its Reconditioner in mass production.

Above is a view of the final assembly line.

For information on this machine write or wire for Bulletin TR-42.

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT, 11
MICH. U.S.A.

velope designed to keep blue-prints, work orders, and factory forms free from dirt and grease in the shop.

The envelope has bound edges to prevent tearing or breaking and is flame, oil, and moisture proof. Standard size is 10" by 12", but larger sizes are available for special needs.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

SELF-CLEANING DRILL (L62)

Substantial savings in time on drilling deep holes are reported by users of a new device known as the Rego Karweit Driller, according to the manufacturer, the Bastian-Blessing Company.

The device may be operated at Standard cutting speeds and feed rates for ordinary drills, and in some cases may be run at 25 per cent above conventional cutting speeds. Some users report that unskilled operators have drilled holes 20 times the diameter of the drill without removing the drill from the hole, according to the company.

The driller automatically produces at the cutting edges of the drill small uniform chips which clear the flutes instead of long whipping spirals which score sidewalls of the hole and may injure the operator, the company asserts. Surplus coolant or lubricant washes away the chips and bathes both sides of the cutting edges, keeping the drill cool and lengthening its life.

Rego Karweit Driller

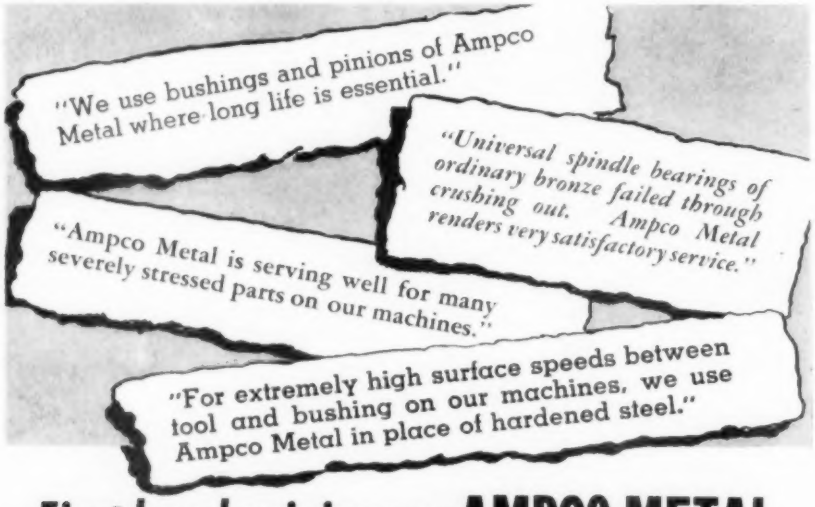
HAND ROLL MARKING MACHINE (L63)

Wm. A. Force & Company, Inc., has made available a new type machine for numbering and marking thin-walled tubing, bevels, and similar cylindrical parts.

Parts to be marked are rolled in synchronization with a standard roll type holder or convex indenting head. Since

(Continued on page 178)

Marking Machine


"We use bushings and pinions of Ampco Metal where long life is essential."
"Universal spindle bearings of ordinary bronze failed through crushing out. Ampco Metal renders very satisfactory service."
"Ampco Metal is serving well for many severely stressed parts on our machines."
"For extremely high surface speeds between tool and bushing on our machines, we use Ampco Metal in place of hardened steel."

First hand opinions on AMPCO METAL show how to solve metal problems

Engineers in the machine tool industry have a very high opinion of Ampco Metal, based on years of experience with this aluminum bronze as standard material. They have tested it under actual operating conditions and proved to their satisfaction that it has hidden reservoirs of strength and service. It outperforms other bronzes, stands up under adverse conditions. Today over 90 machine tool builders use Ampco Metal as a matter of course — evidence of its general acceptance by the industry.

You also may have metal problems. Parts may be failing, causing costly production delays. You can safely profit by the experience of others by applying Ampco at these vital locations. Ampco's strength, hardness, and wear-resistance make it highly desirable for use as parts material where service is severe and where safety depends upon unfailing performance.

Familiarize yourself with Ampco Metal and see how it produces results that reflect credit on your choice. Ask for bulletin, "Ampco Metal in Machine Tools." Free on request.

AMPCO METAL, INC.

DEPARTMENT TE-9 MILWAUKEE 4, WISCONSIN

AMPCO METAL

AMPCO

THE METAL WITHOUT AN EQUAL

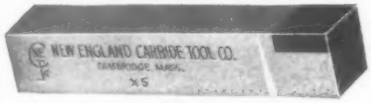
NEW ENGLAND *Standard* CARBIDE TOOLS

Tool Style No. 1

Tool Style No. 2

Tool Style No. 3

Tool Style No. 4



Tool Style No. X5

Tool Style No. X6

Styles 1 to 4 furnished right- or left-hand

THEY ARE PRECISION BUILT —READY FOR THE JOB . . .

ALL NEW ENGLAND Standard Carbide Tools are double checked at the factory to assure you of tools that are *ready for the job!* All tips are finish ground on diamond wheels to correct tolerances and with polished finish. You can count on NEW ENGLAND tools for long life, high production and fine work finish.

You can specify any make or grade of carbide. We will supply it and make your standard or special tools to suit your particular needs. Mail the coupon today for complete details.

TUNGSTEN CARBIDE PRODUCTS • DIAMOND TOOLS • DIAMOND POWDER

NE
TRADE MARK

SEND FOR THESE TODAY

Please send me your new Standard tool folder and a Standard tool wall chart for our tool room.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

T. E.

NEW ENGLAND CARBIDE TOOL CO. 60 BROOKLINE STREET CAMBRIDGE, MASSACHUSETTS

interchangeable lot numbers are desired in many cases, standard roll marking type and roll holder are utilized.

The piece to be marked can be fed into the machine at either end of the stroke, making possible marking of two pieces in one complete cycle. An unskilled operator can turn out 500 or more pieces per hour after a few minutes of instruction, according to the company.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

VERTICAL BENCH MILLER (L64)

A variety of jobs, such as die making, die sinking, profiling, jig boring, and key slotting may be done without tieing up a large machine by using the new Benchmaster vertical bench milling machine with quick-change attachment for horizontal milling, according to the maker, Benchmaster Tool Company.

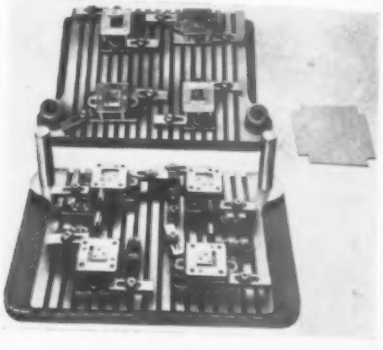
The arm supporting the spindle head is clamped to the column and can be adjusted to rotate the spindle 60° either side of center. If horizontal milling is required, the entire head is removed and an enclosed horizontal milling attachment installed. Hand cranks control micrometer adjustments for the table movements. The machine is compact in design, standing 30" high. It has a precision ground table, 6" by 14", with three T slots.

Bench Miller

CORNER NOTCHING ADJUSTABLE DIE (L65)

As an aid to speeding up production in certain war jobs, S. B. Whistler & Sons have developed a corner notching adjustable die.

According to the company, depth or angle of notches can be varied to suit individual requirements simply by changing position of the die units. The dies also can be combined with special and standard sizes of round, oblong, and square hole adjustable punches and dies for perforations to be made in the same press run.



Corner Notching Die

INSPECTION SNAP GAGE (L66)

With its chief feature an extended lower anvil which readily locates and

(Continued on page 180)

Greenfield Snap Gage

On any surface...on any war job
SKILSAW
SANDERS and GRINDERS
GIVE YOU
Finer Finishing Faster!
EVERY MAN
COUNTS FOR MORE
USING SKILSAW TOOLS!
SKILSAW PORTABLE GRINDERS
Grind down raised welds faster. Light, compact, powerful. Perfectly balanced for easiest day-long operation. 2 MODELS.
SKILSAW DISC SANDERS
Speed up all metal cleaning, sanding, filing, grinding with wire brushes (illustrated) cup wheels, polishing pads, etc. 6 MODELS.
SKILSAW BELT SANDERS
Produce a smoother, better "final finish" 10 times faster than by hand . . . on wood, metals, plastics, compositions. 4 MODELS.

● Have you welds to grind . . . metals to clean . . . "final-finishing" to apply on wood or brass or steel? You can do each job better *and faster* with one of these SKILSAW TOOLS! They're specially designed for easier handling. They're skilfully engineered for greater output per man *at war-time production speeds.* They're ruggedly built to stand the gaff of toughest 3-shift operation without time-wasting breakdowns.

Do you wonder why these SKILSAW SANDERS and GRINDERS are favorites everywhere for coarsest grinding or finest buffing. Ask your distributor for a demonstration and see for yourself!

SKILSAW, INC., 5031 Elston Ave., Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Portland • Seattle • Toronto, Canada

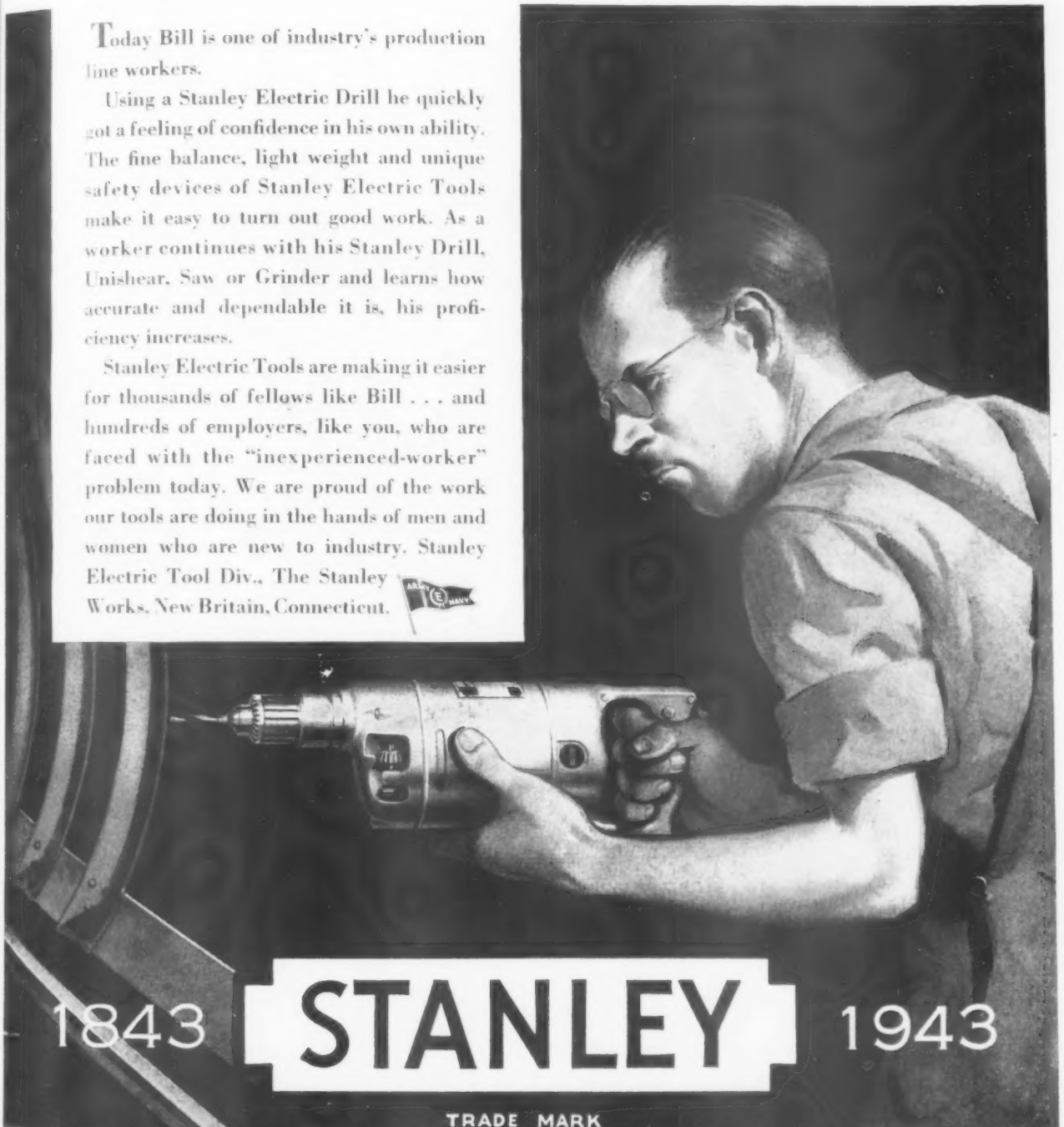
SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

A week ago he was pushing a pen

Today Bill is one of industry's production line workers.

Using a Stanley Electric Drill he quickly got a feeling of confidence in his own ability. The fine balance, light weight and unique safety devices of Stanley Electric Tools make it easy to turn out good work. As a worker continues with his Stanley Drill, Unishear, Saw or Grinder and learns how accurate and dependable it is, his proficiency increases.

Stanley Electric Tools are making it easier for thousands of fellows like Bill . . . and hundreds of employers, like you, who are faced with the "inexperienced-worker" problem today. We are proud of the work our tools are doing in the hands of men and women who are new to industry. Stanley Electric Tool Div., The Stanley Works, New Britain, Connecticut.



1843 **STANLEY** 1943

TRADE MARK

levels the work, a new rapid inspection limit snap gage has been placed on the market by Greenfield Tap and Die Corporation.

The extended anvil makes easier the moving of work to the "go" or "no-go" gage in measuring round parts and in gaging external lengths. It also facilitates gaging work in the machine.

ALL-ANGLE VISE (L67)

A new all-angle "Drive Wheel Movement" vise has been introduced by Berco Manufacturing Company. The vise has three protractor dials for horizontal, vertical, and diagonal settings.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

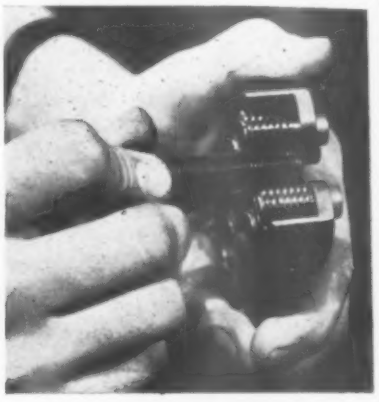
Included among features cited for the vise are a drive wheel motion with 2-¾" lateral clearance, double swivel construction, right angle clearance to permit perpendicular position without base obstruction, and positive horizontal setting.

The vise is recommended for use with grinders, drill presses, milling machines, magnetic chucks, and many other bench jobs. It is available in 3-½", 4½" and 6" sizes.

Free Swinging Vise

THREAD ROLL SNAP GAGE (L68)

Sheffield Corporation has added a new thread roll snap gage to its line of checking equipment. The new gage consists of two sets of free turning gaging rolls mounted in a regular frame.



Thread Roll Gage

One set of rolls represents the "go" limit, the other the "no go" tolerance.

Checking the assembly of male threads with female threads assures uniformity within the work passed, the company points out. Other advantages cited for the roll gages are faster inspection than is possible with ring gages, economy because of little wear and consequent reduction in number of replacements, and need for fewer gages because one roll gage can replace from two to four ring gages.

TUBE FITTINGS (L69)

A new line of Hydraulic and industrial tube fittings, designed to provide safe dependable connections without the use of welding, threading, or soldering has been developed by the Cotner-Wilkinson Company. Known as "Collet Grip", the tube fittings will hold up beyond the strength of the tubing itself, according to the company.

When the unit is installed, the compression nut holds the collect nut firmly to the tubing and compensates for any variation in the O. D. of the tubing. The collect nut grips the tube firmly

(Continued on page 182)

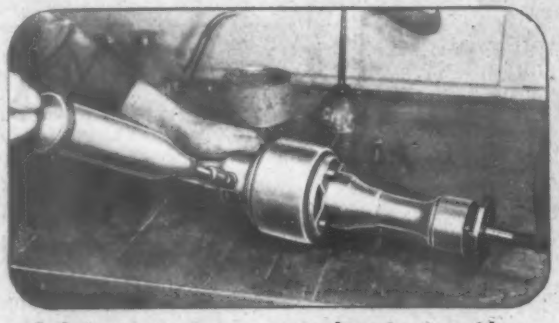
Woody Spencer says...
"KNOW HOW TO SELECT THE PROPER TOOL — GET 100% MORE TAP-LIFE!"
(No. 2 in a series of WOOD & SPENCER "KNOW HOW" messages)
Save time, material and labor . . . choose tools best suited to the job . . . insure quality results, fewer broken taps and longer tap-life. Remember, every saving in production time, every saving in material brings our Victory closer. To this end, we offer the following suggestions on tap use . . . apply them to your work; watch the results!
1. High-speed steel taps will tap more holes and break more easily at high speeds than at slow.
2. When tapping by hand, do not run the tap in a few turns, then back it up. Once started, go forward — there is much less chance of tap breakage, and better threads will result.
3. In cast iron, high-speed steel taps will do much more work than carbon-steel taps—and do it faster. High-speed steel taps resist the lapping action much better.
4. Be sure blind holes are drilled deep enough so taps cannot strike the bottom, or breakage will result.
Follow these rules—turn out high-quality work faster and with less waste . . . keep buying War Bonds. It's a combination the Axis can't beat! Write today . . . tell us your problems.
From customers' blueprints, we quite frequently make recommendations for
WOOD & SPENCER CLEVELAND
"THE RIGHT TAP AT THE RIGHT TIME"
The Wood & Spencer Company
Cleveland, Ohio

Pneumatic Grinders Get Gruelling Service

— PREVENTIVE MAINTENANCE IS IMPORTANT

In shipyards, steel mills, foundries and other industries, CP Pneumatic Grinders are getting tough usage, and practically continuous service. Like any well-built tools, they deserve simple, preventive care. Grease and oil them at regular intervals . . . keep nuts tight . . . clean air strainers . . . blow air lines free of moisture and dirt. If these simple precautions are taken regularly, CP Pneumatic Grinder maintenance will be kept to a minimum.

HOW TO GET MAXIMUM SERVICE FROM CP PNEUMATIC GRINDERS



Lubricate governor, upper bearing weekly. Clean out, renew grease every three months.

Grease the spindle bearing weekly. Clean out and renew grease every three months.

On each shift, fill the oil reservoir with 200 viscosity oil to lubricate the motor.

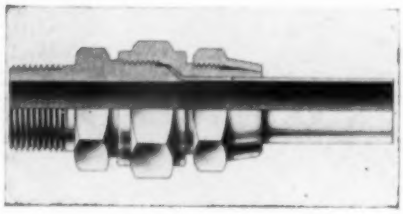
Check all nuts — on all portable tools — at regular intervals. Be sure they are tight.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES



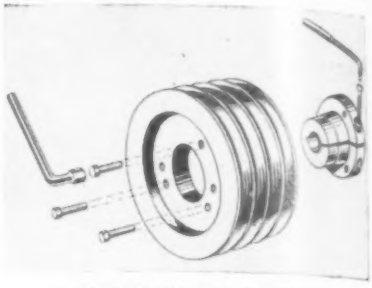
Collet-Grip Tube Fitting

without damage from digging or cutting. The load is placed on the tube, directing the pulling stresses away from the flares, the manufacturer points out.

QUICK DETACHABLE DRIVE SHEAVES (L70)

Pyott Foundry & Machine Company announces a new sheave that can be attached to or removed from a shaft with only a socket wrench. Designed for use with multiple v-belt drives, the device is said to be so constructed that it can be mounted or removed any number of times without damage to shaft or motor bearings.

The unit consists of a special tapered hub which is slipped onto the shaft and tightened down with a cap screw. The sheave then is slipped on over the hub and tightened with pull-up bolts which engage threaded holes in the hub. To remove the sheath, the pull-up bolts are unscrewed and two others are inserted in special tapped holes in the



Detachable Drive Sheath

sheath and tightened down. The bolt ends come to rest against the hub and force the sheath free without use of a hammer or other tools.

SPEED CLAMPS (L71)

Three new speed clamps have been placed on the market by Grand Specialties Company.

Known as the "Quick Lockcet" one of these clamps is designed for light fast work. The seat has a swinging lock lever which, the company states, makes it non-creeping and assures a firm grip on slanting or rounded surfaces. An instantaneous trigger release keeps the screw under pressure.

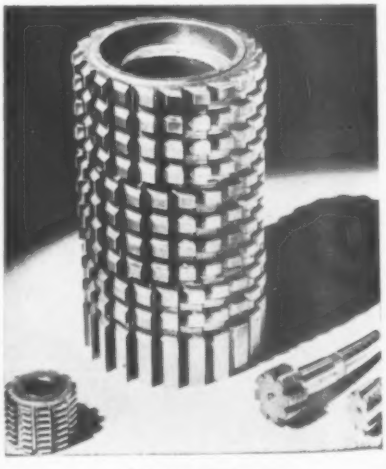
The Grand Heavy Duty speed clamp is used with large, heavy work, such as welding heavy plate or building dies.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

MULTIPLE THREAD MILLING CUTTERS (L72)

Plan-O-Mill Corporation announces a new line of multiple thread milling



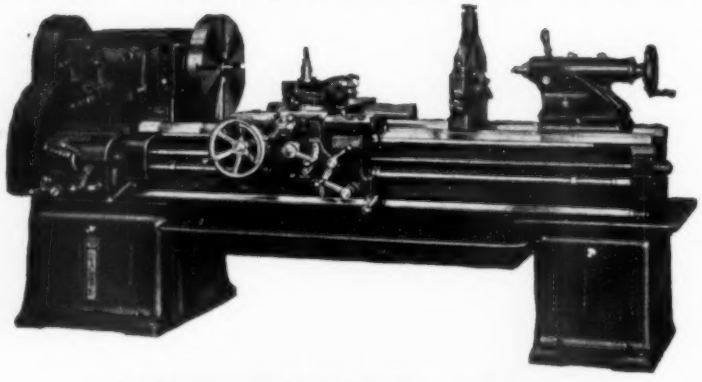
Milling Cutters

cutters in National, Whitworth, Acme, V, and special forms.

The cutters are available with straight or spiral flutes, and with or without special tooth for removal of imperfect thread. A complete range of sizes is offered by the company.

THE END.

---this is The METALMASTER



SUPER-QUALITY LATHE

Bradford's finest achievement in 100 years of building metal-working machinery

★ ★ ★

Twelve speeds in geometric ratio in both forward and reverse.

High-grade heat treated alloy steel gears.

Constant speed standard frame motor, rugged and free from vibration.

Exceptionally long wings planed and hand-scraped to a full length bearing, with gibs front and rear.

★ ★ ★

1840 - 1943

ALSO MANUFACTURERS OF DRILLING AND TAPPING EQUIPMENT

★ ★ ★

Spindles made from high carbon molybdenum steel forgings bored from solid stock.

Heavy duty tapered roller spindle bearings, preloaded and easily adjusted.

Bed 50% to 60% steel with smooth wearing surface.

Heavy elliptical cross-girths to prevent springing under heaviest cuts.

★ ★ ★

THE BRADFORD MACHINE TOOL CO.

EVANS STREET SOUTH OF EIGHTH, CINCINNATI, OHIO

PRECISION TOOLS SINCE 1840

More PRODUCTION AT Less EXPENSE FROM YOUR AIR TOOLS

● Carefully made of the best materials, from correct designs, CLECO pneumatic tools are built to stand the service on *any* job. However, increased production depends upon a few simple precautions, which often have no bearing directly on the tool itself. Here are a few:

Be sure to use the right grade of oil. In general, a light oil of high quality is what you need.

Avoid abusing the tool by rough handling, permitting parts to become loose; using unsuitable wrenches, or clamping the body of the tool in a vise. Leave repairing to the regular tool repair man.

Use adequate hose and pipe lines, with traps for water and trash.

Oil the tool about once an hour when the service is continuous.

Don't remove screens in connection bushings.

THIS HAMMER SURE HAS GOT A KICK TO IT !!!
120
LOOK AT YOUR AIR PRESSURE — AT 80 TO 100 LBS. THE TOOL WILL GIVE YOU MORE WORK IN THE LONG RUN, AND WILL HOLD BETTER TOO

Use air of the correct pressure, generally 80 to 100 pounds at the tool.

50,000 OF THESE FREE BOOKLETS ARE HELPING SPEED PRODUCTION

Have you sent for your copy?

The cartoons shown here are samples from our tremendously popular Cleco Cartoon Booklet, full of easy-to-remember operating instructions. Send *now* for your free copy.

THE CLEVELAND PNEUMATIC TOOL CO.

Branch Offices in All Principal Cities — **3781 East 77th St., CLEVELAND 5, OHIO**

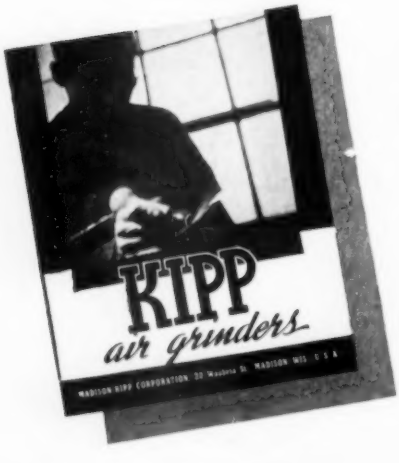
THOUSANDS OF NEW USERS,

THOUSANDS OF NEW USES!

$29.75

DEVELOPED BY
PRACTICING TOOLMAKERS

THE MODEL H 50,000 R. P. M.



KIPP *air* TOOL CATALOG
IS *Yours* FOR THE ASKING

KIPP *air* GRINDERS

Every toolmaker, every tool crib, every machine shop and thousands of production jobs need a Model H, K or VT Kipp Air Grinder or all three of them. Because of expanded facilities the delivery position on high ratings has been measurably improved. Accessories in reasonable quantities can usually be shipped out of stock. Madison-Kipp Air Grinders were developed by practicing toolmakers so they *are* practical. They usually pay for themselves on a single job.

Sole Agent in England: Wm. Coulthard & Co., Ltd., Carlisle

MADISON-KIPP CORPORATION 209 Waubesa Street MADISON 4, WIS. U.S.A.

JUST OUT!

SURFACE SPEED TABLE AND TOOL SELECTOR

RED SHADED AREA INDICATES GENERAL HIGH SPEED STEEL CUTTING RANGE

YELLOW SHADED AREA INDICATES GENERAL TANTUNG CUTTING RANGE

BLUE SHADED AREA INDICATES GENERAL CEMENTED CARBIDE CUTTING

TABLE OF SURFACE SPEEDS PER MINUTE

REVOLUTIONS PER MINUTE

HIGH SPEED STEEL

TANTUNG

CEMENTED CARBIDE

Kennametal

CORPORATION

WESTERN UNION

1201

SYMBOLS

DL = Day Letter

NL = Night Letter

LC = Deferred Cable

NLT = Cable Night Letter

Ship Radiogram

CLASS OF SERVICE

This is a full-rate Telegram or Cable-gram unless its deferred character is indicated by a suitable symbol above or preceding the address.

A. N. WILLIAMS PRESIDENT

NEWCOMB CARLTON CHAIRMAN OF THE BOARD

J. C. WILLEVER FIRST VICE-PRESIDENT

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

1943 AUG 5 PM

CU126 74/73=WUX NORTHCHICAGO ILL 5 216P

PRODUCTION MANAGER=

ANY DEFENSE PLANT

NEW TABLE OF SPEEDS, FEEDS AND TOOL SELECTOR JUST OFF PRESS. PRINTED IN FOUR COLORS TO GIVE INSTANT SELECTION OF CORRECT CUTTING TOOL. ONE GLANCE SHOWS WHEN TO USE HIGH-SPEED STEEL, TANTUNG OR CARBIDES TO THE BEST ADVANTAGE. CHART IS PRINTED ON HEAVY STOCK, PUNCHED AND READY TO HANG. ONE OR MORE WILL BE SENT TO YOU WITHOUT COST OR OBLIGATION. PLEASE ADVISE THE NUMBER OF CHARTS YOU WILL NEED FOR YOUR PLANT=

VASCOLOY-RAMET CORPORATION.

4327

VASCOLOY-RAMET CORPORATION · NORTH CHICAGO, ILLINOIS

NEW LITERATURE

T. M. REG. U. S. PAT. OFF.

OF INTEREST TO PRODUCTION EXECUTIVES

(827) Tapping

Guide For Production Tapping. 8 pp. Cleveland Tapping Machine Company. This pocket size manual has been written especially for production men. It covers questions of tapping speeds and lubricants for all common metals.

Also included in the booklet are a method of computing the per-minute production for a lead screw tapping machine, a table for determining spindle speeds for any particular tap, and a quick-reference chart showing seconds per piece with the output per hour at 80 to 100% of efficiency.

(828) Steel Selector

Ziv Steel & Wire Company has available a sliding-scale tool steel selector giving characteristics of various tool steels for particular jobs. It answers such questions as what steel to use for shear blades, what is required in a steel to be used in a laminated die, and which steel to select for drawing dies.

(829) Cutting Tools

Hand-Stoned Cutting Tools. 12 pp. Behr-Manning Corporation said by the publisher to be the first book of its kind, this treatise on hand-stoning summarizes the techniques and advantages of the operation. It discusses why tools incorrectly sharpened break down and cites reports to show that oil-stoned edges cut faster and hold up longer than those obtained by other methods. The book is well illustrated.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(830) Gages

21 Electric Gages to Aid Production. 8 pp. General Electric Company. This article reprint describes the functions of electric gages and includes a chart showing diagrams of electric gage circuit applications. Types of gage included are pressure, thickness, magnetic, strain, electrolimit, and eccentricity.

(831) Crane Servicing

P & H Crane Trouble Shooter, 32 pp. Harnischfeger Corporation. Designed for materials handling men in charge of servicing overhead cranes, this booklet is arranged in question and answer form and is indexed for ready reference.

It contains, in addition to causes and cures of probable troubles, complete lubrication charts, standard crane operating signals, sample inspection report, operating cautions, and a schedule on safe lifting of loads with chain, wire rope, manila rope, and sisal rope slings.

(832) Tools

Tools For Production. 8 pp. David J. Ross Company. This new catalog lists the company's line of punch presses, precision vises, and adjustable milling spacers. It is the first published list of all the company's products.

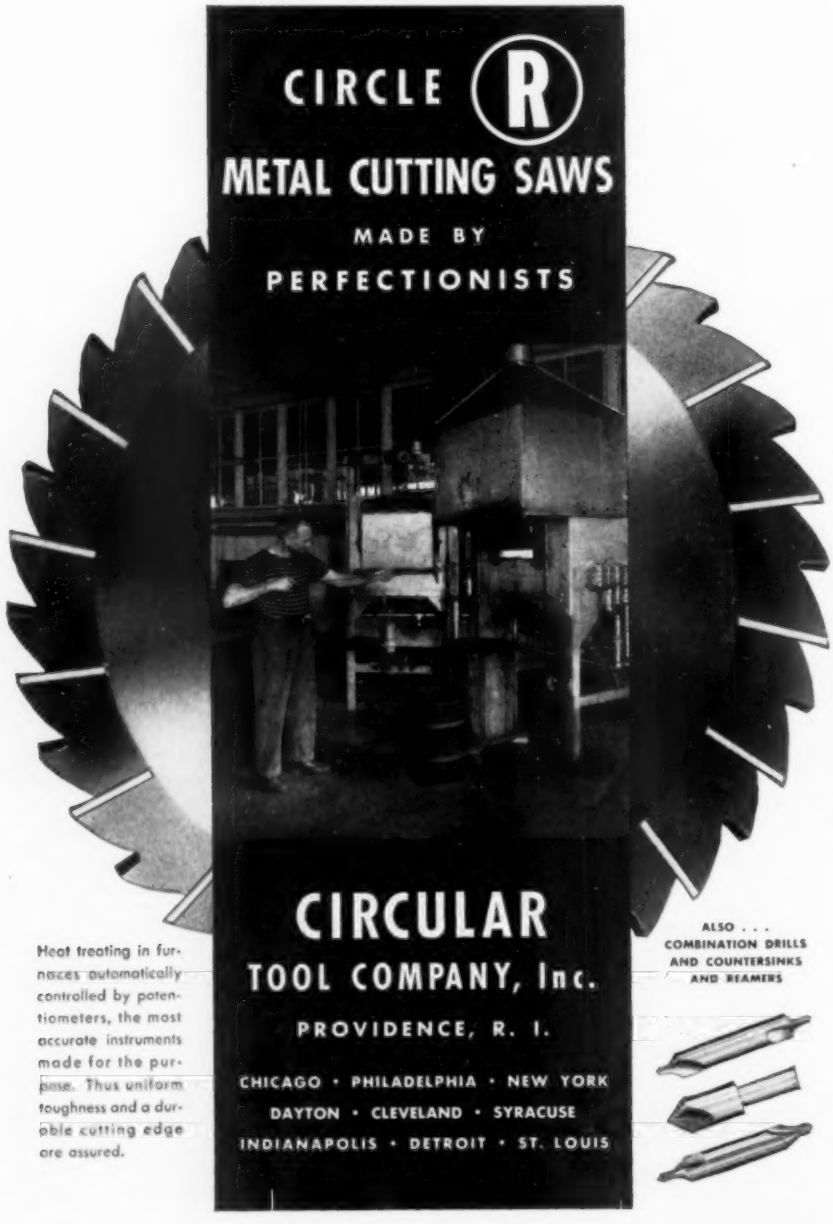
(833) Tap Grinder

Blake Tap Grinder 8 pp. Edward Blake Company. This new illustrated catalog in color describes features of the No. 1 and No. 2 Blake Tap Grinders. It covers standard and optional equipment such as a new locating arm and finger, attachment for grinding two-flute taps, special collet chuck spindles, and special OD tailstock.

(834) Lathes

South Bend Precision Lathes. 12 pp. South Bend Lathe Works. This new

(Continued on page 188)


CIRCLE R
METAL CUTTING SAWS
MADE BY
PERFECTIONISTS
CIRCULAR
TOOL COMPANY, Inc.
PROVIDENCE, R. I.
CHICAGO • PHILADELPHIA • NEW YORK
DAYTON • CLEVELAND • SYRACUSE
INDIANAPOLIS • DETROIT • ST. LOUIS
Heat treating in furnaces automatically controlled by potentiometers, the most accurate instruments made for the purpose. Thus uniform toughness and a durable cutting edge are assured.
ALSO . . .
COMBINATION DRILLS
AND COUNTERSINKS
AND REAMERS

Flying High

Broaching a three blade propeller hub in the Lapointe 4L variable speed Hydraulic Broaching Machine.

Flying high like a song on the wing goes the smooth effortless flow of power in the air. Like the quill from an angel's wing — like stardust on the moon — like a dream for the future — is the romantic story of broaching today.

Just as the broach turned the horseless carriage into the family runabout, so also is broaching turning the flying chariots into dependable mass produced precision birds of flight.

ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A

catalog, devoted to information on models A, B, and C South Bend 9" lathes illustrates and describes both bench and metal column base types available.

(835) Steel Tester

Spark Testing Guide. Carpenter Steel Company has developed a 21" by 30" wall chart guide for spark testing tool steels. It is designed for segregating tool steel scrap, unscrambling mixed stocks, and determining identity of tool steel before heat treating. The booklet describes and illustrates spark patterns caused by various alloying elements in tool steel. Instructions on grinding wheel speeds and other details on fundamentals of spark testing are included.

(836) Diamond Tools

Engineered Diamond Tools. 16 pp. Wheel Trueing Company. This catalog describes the company's Tru-Line blade-type diamond tools for wheel dressing. Various models for particular jobs are illustrated and described. Also included is a list of machines on which the tools can be used.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(837) Coolant Cooler

Kramer Coolant Coolers. Kramer Trenton Company. This bulletin describes and illustrates the shell and fin cooler manufactured by this company. It includes a table of dimensions and fittings for different models and a list of capacities for each size unit.

(838) Surface Plates

Surface Plates. 4 pp. Barco Scraping Company. Properties and uses for the Barco surface plate are discussed in this new bulletin. Particular stress is laid on the use of the plate for controlling accuracy in machine shops, tool rooms, and inspection departments.

(839) Drill Presses

Boice-Crane Company has available a new booklet presenting the company's line of helmet heads and drill presses. One section is devoted to tapping heads and tells how to get cleaner and more economical light tapping.

Engineering data and suggestions for incorporating Boice-Crane drill press heads, parts, and work tables into special machines and fixtures for all kinds of jobs are included.

(840) Sine Checking

Taft-Peirce Manufacturing Company, Woonsocket, R. I., has available a new 20-page booklet describing the company's sine checking equipment. It illustrates and discusses the 5" and 10" sine bars, sine block, sine bar fixtures, sine block taper testing fixture, and bench center.

Also included are instructions in application of the sine bar, and full tables of constants for the 5" sine bar, together with conversion factors.

(841) Safety

Power Press Protection. Junkin Safety Appliance Company, Inc. This booklet outlines safety measures to be followed in plants using hazardous power machinery.

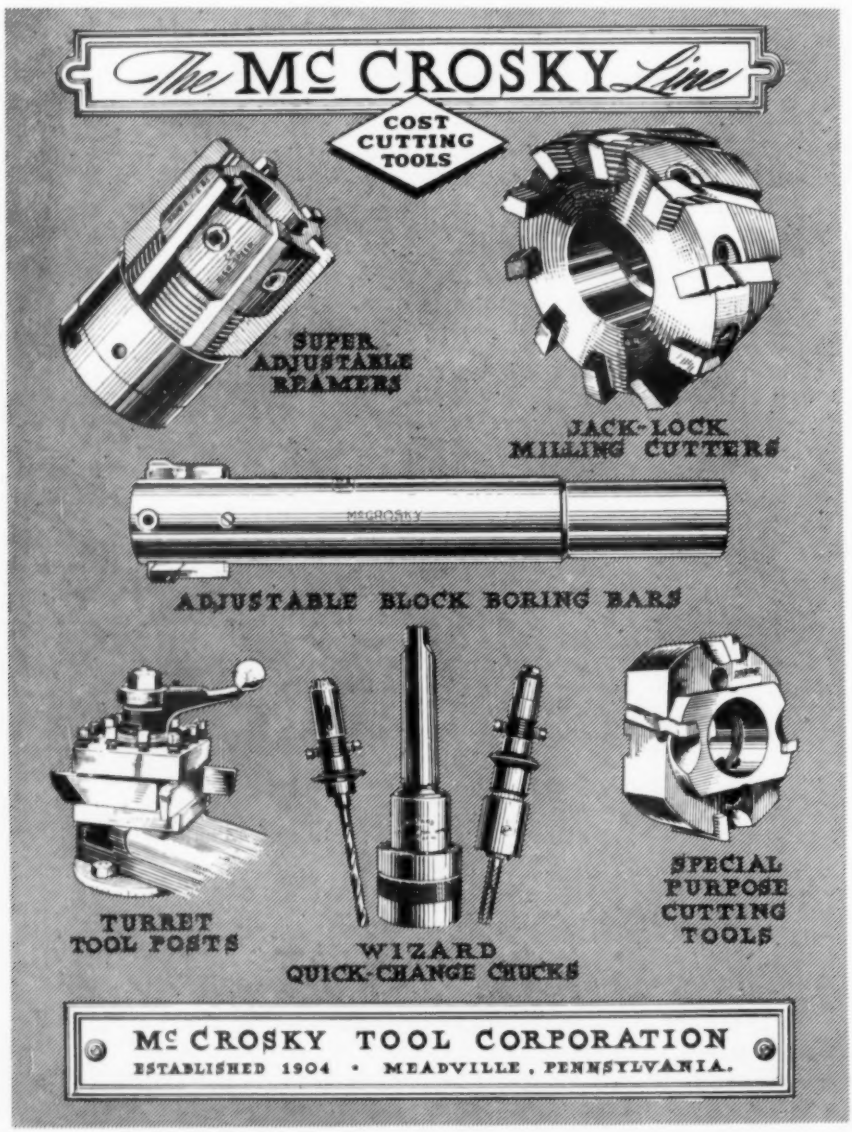
(842) Automatic Timers

Timers, Relays, Switches. 24 pp. R. W. Kramer Company. Said by the company to be the most complete current catalog available on automatic timing equipment. This booklet describes the functions of many different types of timers and indicates the particular application for which each is best suited. Included are discussions of automatic time controls; internal and automatic reset timers; time delay relays; cycle, impulse, percentage, and multi-contact timers; running time meters; signal control switches; contact making clocks, and time relays.

(843) Heat Furnace Control

Protective Combusted Atmospheres in Hevi Duty Furnaces. 10 pp. Hevi Duty Electric Company. This bulletin deals with atmospheric control in heat treating furnaces to protect the surface of the work against oxidation and decarburization while in the furnace. It deals primarily with atmospheres hav-

(Continued on page 190)



Positive and simple blade-locking devices in McCrosky inserted-blade cutting tools insure assembled rigidity and adjustment control in regrinding. For drill press and lathe jobs requiring a series of operations, McCrosky tool-holding devices eliminate time-out for tool changes.

Descriptive Bulletin on request.

3 Unit-Type Drilling and Tapping Machines Replace Six Standard Machines

Savings in Machining Time =

92.6%

Nine spindle drilling and tapping machine which reduced machining time from 42.31 minutes to 3.10 minutes. Part is crankcase intermediate rear for airplane engine.

91.4%

Six spindle machine. Drills, spot-faces, chamfers and taps. Reduced machining time from 35 minutes to 3 minutes. Part is crankcase main rear for airplane engine.

71.4%

Nine spindle machine. Drills chamfers and faces. Reduced machining time from 3½ minutes to 1 minute. Part is rear crankcase for airplane engine.

Savings like these are common with Barnes' Unit-Type Machine Tools. These are but three of a battery of similar machines installed in the plant of a prominent manufacturer of airplane engines. The parts were formerly machined with standard machines using jigs and fixtures. After installation of the Barnes' Unit-Type Machines, a savings in both production and manpower were obtained. In addition to this outstanding saving in machining time, additional savings were obtained in handling time because several spindles work simultaneously in place of one at a time.

These are three examples of how Unit-Type Special Machines increase production. Perhaps you can save time in a similar way . . . Our engineers will be glad to assist you in your selection of equipment for faster boring, milling, drilling, tapping, reaming and honing operations. Call on them without obligation.

GET THESE PRODUCTION AND TOOLING IDEAS

Free set of eight bulletins describing a better way to get better machines. Each bulletin traces a machining problem from the original study of the part to the final machine design. Each may suggest a more productive tooling set-up that you can use today—valuable file information for tomorrow. Write for Bulletins 943.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

ing a combusted gas base as distinct from those formed by direct cracking of raw gases or hydrocarbon oils.

(844) Electronics

The ABC of Electronics at Work. 36 pp. Westinghouse Electric and Manufacturing Company. This book explains fundamental principles of the six ways in which electronic tubes work.

Drawings and diagrams are employed to show how electronic tubes rectify, amplify, generate, control, and transform light into current and current into light. Industrial and military applications of each type are discussed. Included in the uses listed for electronics are high frequency heating, resistance welding control and industrial x-ray application.

(845) Hydraulics

Setting New Efficiency Standards With Oil Hydraulics. 4 pp. Denison Engineering Company. This bulletin deals with the application of hydraulic units made by the company to various machine operations. Well illustrated, it shows adaptation of oil hydraulics for turning, indexing, and similar operations on such machines as presses and bending machines.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(846) Chip Breaker Grinder

GT-158. Carboloy, Incorporated. This new technical bulletin gives complete specifications of the new Carboloy flexible chip breaker grinder. It contains photographs and descriptions of the grinder and discusses use of the machine for grinding both angular and parallel type chip breakers as well as those used in roller turning tools. Set-ups for grinding top, relief angles, and radius in boring bits are included.

Carboloy also has available a 20-page booklet, **D-115,** outlining free training courses in carbide die servicing. The courses are open to selected individuals in any mill using cemented carbide dies. They are arranged so that training of any individual can be limited to the specific problem encountered in his own mill, thus shortening the course to a few days.

(847) Rotary Finishing Machine

Rotary Automatics. 8 pp. Hammond Machinery Builders. This illustrated bulletin gives detailed information about the Hammond 6 and 8 spindle rotary table automatics. It shows various combinations of relatively standard units and their flexibility in adjustment of heads, table speeds, and work-holding chucks. Also included is a list of construction features, and a table of specifications tabulated for ready reference.

(848) Air Tools

Air Power. 24 pp. Mead Specialties Company. This new catalog describes and illustrates the Mead line of air-powered equipment. It includes specifications and uses of the company's air cylinders, clamp, vise, press, work feeder, manifold, and valves.

(849) Machine Tap

Type B-M Collapsible Machine Tap. 8 pp. Murchey Machine & Tool Company. This new catalog describes and illustrates the collapsible machine tap manufactured by the company. It contains a table of principal dimensions, and drawings showing assembly and adjustment.

(850) Wheel Speeds

Devine Brothers Company has published a new **Wheel Speed Table** for polishing and buffing operators. It is condensed and simplified for easy reference and is shirt pocket size. Preferred and recommended wheel speeds are given in red for easy reading. The table also is intended for use as a book marker for use in catalogs or reference books.

(851) Abrasive Cutting

Abrasive Cutting Tip Sheet, 4 pp. A. C. Campbell Division, American Chain & Cable Co. This monthly publication is designed to give helpful hints on various problems connected with abrasive cutting. It contains articles on specific jobs and shortcuts on various

(Continued on page 192)

War Plane Specifications Require Torquing
Modern manufacturing methods call for controlled "settings" of vital nuts, screws, bolts, hydraulic fittings — of almost all threaded parts. Leading American aircraft and engine builders almost universally use the permanently accurate STURTEVANT TORQUE WRENCHES for innumerable applications ranging from building precision instruments to testing frictional drag in controls and motors. 50 models, capacities ranging from 0 to 5 inch pounds on up to 7200 inch pounds.
Write for catalog sheets.
Model F-100-I (Capacity 0-100 in. lbs.) Illustrated
P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

6500 HOURS

OF HEAVY DUTY OPERATION IN 9 MONTHS!

INDEX MILLING — GRINDING — VERTICAL MILLING — SPUR GEAR CUTTING — AUTOMATIC CUT OFF — CONTINUOUS MILLING OF BAR AND COIL STOCK — ROTARY MILLING — CONTOUR MILLING — CLIMB MILLING — BLIND MILLING

The American Fork and Hoe Company of Ashtabula, Ohio, has employed a battery of U. S. Multi Millers to the practically continuous production of (censored) parts. The photograph above illustrates a battery of these versatile machines in operation at that plant. Quoting the American Fork and Hoe Company:

> "To the best of our knowledge this is the heaviest cut ever performed by one of these machines. It is approximately 4¼" long, squares one corner and form mills the center. Approximately .030" stock is removed. Cutter speed is 66' per minute and material being milled is 1080.
>
> "These machines have been in continuous service 24 hours per day, six days a week, with a minimum of maintenance, considering the heavy load. The cycle is entirely automatic. All the operator does is load the piece in the fixture, trip the hand lever to start the cycle, and then remove the finished piece. After the cutting cycle, the machine returns automatically to the starting position where it stops and awaits reloading."

Successful performances of U. S. Multi Millers are similarly reported by many other plants now engaged in vital war work . . . we are proud of the stamina, sustained accuracy and production records established by these popular machine tools.

Bulletin 60T illustrates all U. S. Multi Miller features.
Write for your copy . . . no obligation.

U. S. MULTI MILLER

★

U. S. TOOL COMPANY, INC., Ampere, (East Orange), New Jersey

operations. Each issue contains information about a special cutting job.

(852) Tool Shanks

Victory Tool Shanks. 12 pp. Cooper-Bessemer Corporation. This booklet discusses the company's meehanite metal tool shanks designed for tipping with carbide. It contains information on sizes and shapes available and outlines characteristics of the shanks for different tooling jobs.

(853) Cutting Tools

Machinists Tool Company has issued a new catalog, designated as **No. 5**, containing a list of the variety of tools manufactured by the company. Included are angle cutters, broaches, counterbores, end mills, concave and convex cutters, milling cutters, gear cutters, reamers, metal slitting saws, tool bits, T-slot cutters and keyseat cutters.

THE END

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

Tannewitz VARIABLE SPEED BAND SAWS Are Metal-Cutting EXPEDITERS!

Removing gates and risers from steel, cast iron, manganese bronze, hard and soft brass, aluminum and magnesium castings, as well as many other metal cutting jobs, are handled with great dispatch and surprising savings on TANNEWITZ VARIABLE SPEED BAND SAWS. And since they are available in any 3:1 speed ratio from 100:300 to 1000:3000 blade feet per minute, with instant adjustment to intermediate speeds, one machine serves ideally for cutting a variety of materials. Made with 30", 36" and 42" wheels.

Other models (single speed) for such purposes as sawing large blocks of aluminum and magnesium, cutting large steel templates etc., are available in capacities and speeds to ideally accommodate work of practically any size or character. For complete facts write for bulletin on Variable Speed Band Saws. Also on request bulletins on: Sheet Metal Cutting Band Saws; DI-SAWS, combination band saws for sawing, filing, polishing.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

NEW BOOKS

Analysis of Machine Shop Operations. National Foremen's Institute, Deep River, Conn. $7.50. The title of this 165-page book is unfortunate in that it does not explain the publication is a manual for training apprentices and workers.

Written by a training specialist for the War Manpower Commission, Donald F. Lane, this manual is slanted toward employers who are contemplating training programs for machine operators. It consists principally of 19 sets of data sheets, one for each of the common machine tools and practices. These data sets contain a brief description of the machine or process, a list of operations performed, an estimate of learning time, and a list of tools required for the job. Included among the machines and operations discussed are drill presses, power saws, turret lathes, heat treating, and bench work.

Other information in the book covers inauguration of a training program, job inventory, training on the job, employment of women, and similar problems. The manual is published in three-ring loose-leaf binder form, with pages 8½ by 11 inches.

Foremanship and Accident Prevention in Industry. Published by the Engineering Department, American Mutual Liability Insurance Company, Boston, Mass.

This book endeavors to teach foremen the fundamentals of accident prevention. It devotes considerable discussion to such problems as causes of accidents, hazardous maintenance equipment, accident control in manufacturing methods, and personnel control in accident prevention. An excellent feature of the book is a double page chart showing requirements of safety clothing for employees doing different types of hazardous work.

Also discussed in the book are requirements of a good foreman, his place in industry, and the several functions of the foreman in promoting industrial safety. Copies of the book are available to executives of plants engaged in war work, as well as to policy holders of the publisher insurance company.

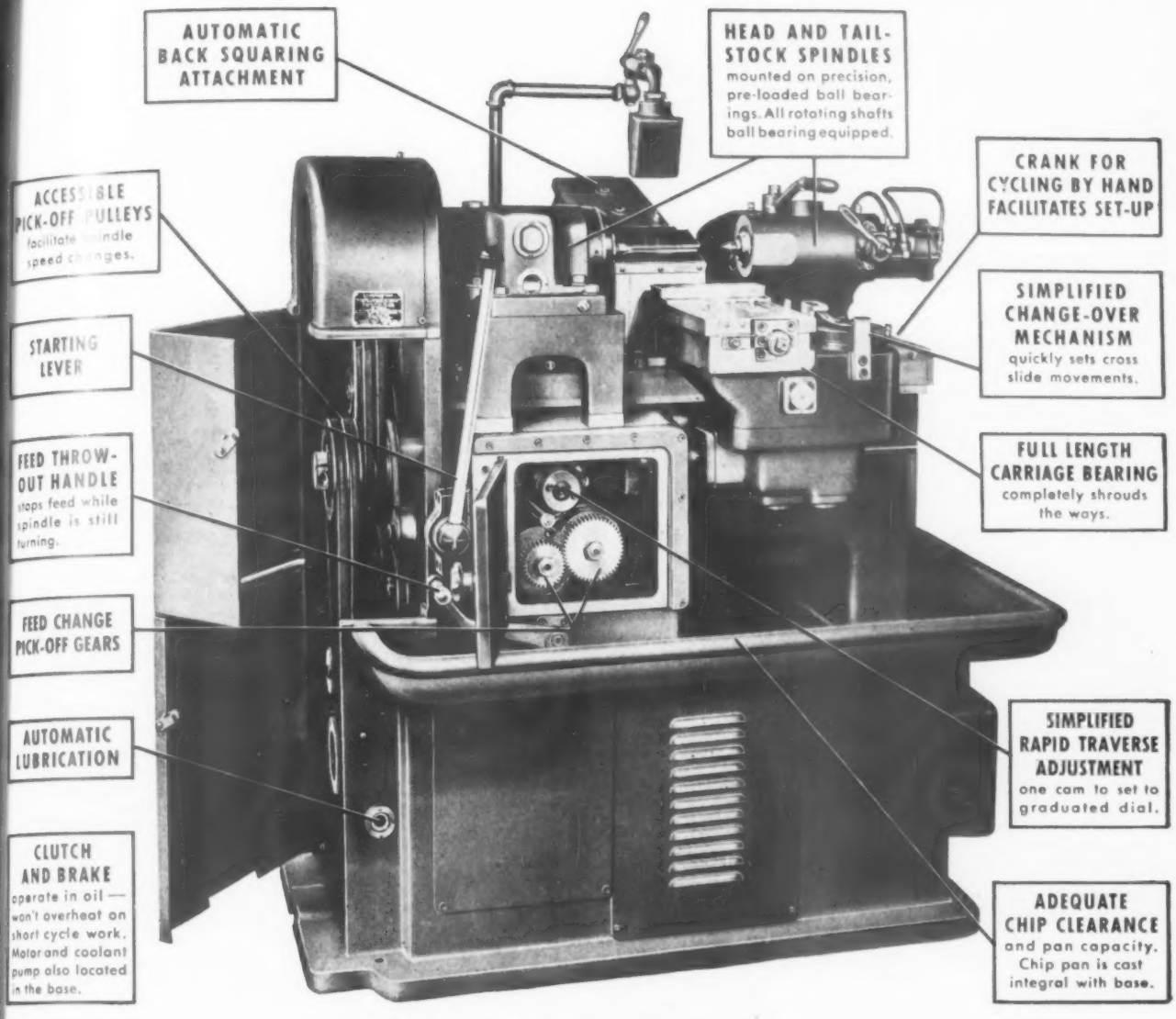
THE END

New Method Developed For Spot Weld Testing

Quick, simple testing of spot welds for strength and soundness is possible with a new, recently developed method which utilizes a small shear testing machine.

According to Westinghouse engineers who developed the method, the specimen to be tested is clamped in the machine and a shear is applied. A gage shows the force applied in pounds, and a prepared chart gives the minimum required strength for the various thicknesses and types of materials.

Users of the new method say it aids in controling quality of welds, serves as a quick check on setup of the spot welder, and permits tests to be made by operator or floor inspector. Also, the machine is compact and simple to operate. THE END


AUTOMATIC BACK SQUARING ATTACHMENT
HEAD AND TAIL-STOCK SPINDLES mounted on precision, pre-loaded ball bearings. All rotating shafts ball bearing equipped.
CRANK FOR CYCLING BY HAND FACILITATES SET-UP
ACCESSIBLE PICK-OFF PULLEYS facilitate spindle speed changes.
SIMPLIFIED CHANGE-OVER MECHANISM quickly sets cross slide movements.
STARTING LEVER
FEED THROW-OUT HANDLE stops feed while spindle is still turning.
FULL LENGTH CARRIAGE BEARING completely shrouds the ways.
FEED CHANGE PICK-OFF GEARS
SIMPLIFIED RAPID TRAVERSE ADJUSTMENT one cam to set to graduated dial.
AUTOMATIC LUBRICATION
CLUTCH AND BRAKE operate in oil — won't overheat on short cycle work. Motor and coolant pump also located in the base.
ADEQUATE CHIP CLEARANCE and pan capacity. Chip pan is cast integral with base.

Lo-swing IMP LATHE ... A SMALL, FULLY-AUTOMATIC LATHE, WITH UNLIMITED TOOLING POSSIBILITIES

Designed primarily for work demanding high speeds and extreme accuracy, the IMP's sturdy, compact design makes it equally suitable for turning heavier work such as small pistons, bushings, gear blanks, etc.

Noteworthy IMP features are graphically presented in the above illustration. Note the compactness and accessibility of the parts which require a change in setting when changing over from one job to another. Aside from a change in tool blocks, there are only four adjustments to make: *first*, change of spindle speeds (when required) thru pick-off pulleys; *second*, change of feed pick-off gears (when required); *third*, setting of one *graduated sector* in carriage to control movements of the front carriage cross slide; *fourth*, setting of one rapid traverse cam to *graduated dimensions* on the dial.

Another important IMP feature is the extremely long carriage bearing on the ways, obtained thru a unique head and tailstock design which permits the carriage slides to pass under them. Since the carriage is mounted on a flat and "V" way the same as a grinder, "grinding machine accuracy" and exceptionally fine finishes are possible with light cuts using carbide and diamond point tools.

The spindle is mounted on selected precision ball bearings, and speeds up to 5000 RPM may be maintained. The machine cycle is started by a hand lever which may also be used for emergency stops at any point within the cycle and, of course, the machine stops automatically at the end of its cycle. All shafts are mounted on anti-friction bearings and the main parts, including the carriage ways, are automatically lubricated.

The *Lo-swing* IMP lends itself to practically unlimited tooling possibilities. A Third Slide or Overarm for additional facing or chamfering operations can be furnished as well as a number of other special attachments. Send us your prints or write for complete information about this versatile lathe.

HANDY ANDY

Says —

T.M. REG. U.S. PAT. OFF.

WITH modern invention bridging distances, few things are so essential to world peace, and particularly to our own welfare, as understanding of our neighbors.

To further that understanding, I am going to expand on the theme broached in the August issue. I'll resume with Scandinavia, from whence we'll journey to other lands as opportunity provides. I'll merely ask the reader to bear with brevity. With space "rationed", I can only hit the high spots.

Sweden's neutrality (?) during the Nazi occupation of Norway had its roots in the dissolution of the Swedish-Norwegian Union way back in 1905.

That break was precipitated by an unfortunate trait of the Scandinavians —jealousy between the several states that goes back to remote antiquity. I show this side of the people reluctantly since it reflects on a race whose intelligence I hold in high respect. Yet, it is a fault that pervades all of Europe, one that must be reckoned with in setting up future political divisions.

Among the Scandinavians, however, it is not the jealousy of covetousness nor the envy of "have-nots" for other possessions (Few peoples are as considerate of the rights of others). No, it is the jealousy of emulation and self-determination; self reliant and independent, they chafe under restraint except that which is self imposed.

In many ways it is a healthy and, on the whole, a friendly rivalry that has made the high North one of the most civilized spots on earth—and, inversely, one that almost spelled its collective ruin. For, when danger threatened, each little minority stood alone.

▲ ▲ ▲

The two states having gone their separate ways, Norway veered to the left under a labor government while Sweden charted a middle course under social-democracy. The Norse built up one of the world's largest merchant marines, but, did not rear a commensurate defense, either naval or military. Rather, the laborites discouraged military training and preparedness alike.

And, as force begets counterforce, the conservative opposition gradually inclined toward fascism. Knut Hamsum, world famous author, became one of that body (of which the betrayer Quisling became the head) even as Bjornstierne Bjornson, also a writer of note, had been one of the radicals agitating for separation from Sweden.

Then, with the second world war imminent, Norway's premier spurned a guarantee of integrity by England, and with equal independence, rebuffed an alliance with Germany. The rest, except for the "inside stuff", is tragic history.

▲ ▲ ▲

Divorced from a reluctant partner, Sweden went through a period of readjustment that, evolving into the famed Middle Way, eventually made her the economic "little giant" of Europe. As a consequence, there also evolved a high social order and a nicely coordinated industry. And, while committed to peace, military training and moderate national defenses were maintained. Also, Sweden maintained a fine navy that, greatly augmented today, is declared superior to the Baltic fleets of either Germany or Russia.

This preparedness for possible eventualities was deemed necessary for several reasons. For one thing, both Norway and Denmark were cold to Swedish proposals for a defensive alliance (they were suspicious of Swedish domination) and, to make matters worse, Denmark disarmed outright. Sweden stood alone, the only one of the three Scandinavian states with substance for defense.

▲ ▲ ▲

To complicate matters, the League of Nations had awarded the Aland Islands to Finland despite the fact that the population of the archipelago was predominantly Swedish and that a plebiscite had unanimously favored inclusion with Sweden.

(Concluded on page 197)

Yessir, Here's a SMALL COOLANT PUMP *that "has everything"*

BUILT into this compact package of engineering is the same stamina and high efficiency you'll find in the full-sized counterparts. Into its 16-inch height was designed everything to meet the void in the small machine field.

Now, operators of small machines, such as surface and internal grinders, hand mills, drill presses, etc., can have dependable coolant flow like that supplied by the full-sized models. Sealless type—mounted on outside of tank or pedestal—with choice of three piping arrangements—with motor and pump fully guaranteed.

PIONEER PUMP & MFG., CO. 19645 JOHN R STREET, DETROIT 3, MICH.

BUY WAR BONDS

PIONEER *Pumps*

HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

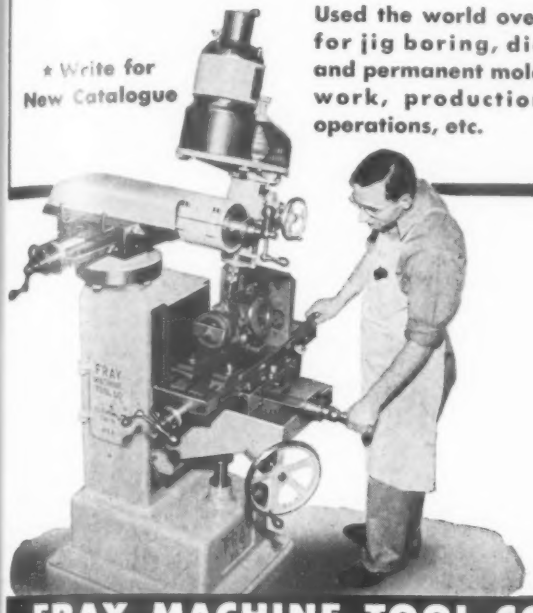
Fray

RAM TYPE No. 7-B

VERTICAL UNIVERSAL MILLING MACHINE

★ Write for New Catalogue

Used the world over for jig boring, die and permanent mold work, production operations, etc.



FRAY MACHINE TOOL CO.

605 W. WINDSOR ROAD, GLENDALE, CALIFORNIA

Makers of "All-Angle" Milling Machines & Milling Attachments

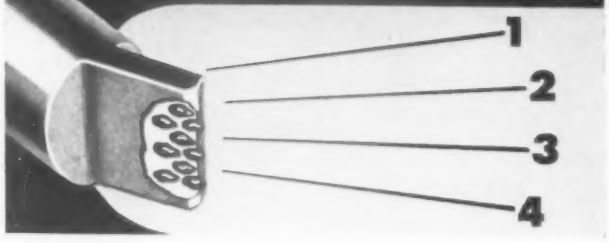
HIGH PRODUCTION OF UNIVERSAL DRILL BUSHINGS HELPS SPEED UP AMERICA'S WAR WORK . . .

From coast to coast America's war plants are speeding their war work with Universal Drill Bushings. They are straight and round, have superfinished bores to insure accuracy and unexcelled wearing qualities. It pays to use Universal Drill Bushings. Write for catalog.

UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

Here's Why TRU-LINE DIAMOND TOOLS SAVE MONEY— SPEED PRODUCTION!



Designed for straight, profile and step dressing operations, TRU-LINE TOOLS are engineered to the job by craftsmen whose many years of experience have taught them the proper application of industrial diamonds and diamond tools to all types of production jobs. TRU-LINE TOOLS embody these money-saving and time-saving features:

1 NO TURNING—diamonds contact wheel at right angles to wheel axis . . . no turning of tool necessary . . . patented blade does not glaze, is always free cutting.

2 OVERLAPPING ROWS—diamonds contacting wheel cut in same line . . . rows overlap—as one row is used another row is in cutting position . . . a continuous cutting surface is thus obtained.

3 THIN BLADE—dissipates heat rapidly . . . diamonds held securely by chemical reaction between diamonds and patented matrix alloy until entirely used up.

4 SELECTED DIAMONDS—the machine, wheel grain texture, wheel hardness and characteristics of piece to be worked are considered in selecting diamonds for TRU-LINE TOOLS . . . smaller diamonds cut tool costs materially.

★ *SEND FOR THIS FREE BOOK TODAY!*

Learn of the many other money-saving and time-saving features of TRU-LINE TOOLS. This new book gives complete details with prices. Send for it today!

WHEEL TRUEING TOOL COMPANY INCORPORATED

3200 W. DAVISON DETROIT 6, MICH.

METAL Stampings DUPLICATED WITHOUT DIES

If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

Send for this Catalog

"METAL DUPLICATING WITHOUT DIES"

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.

O'NEIL-IRWIN DI-ACRO PRECISION MACHINES MFG. CO.

307 Eighth Ave. So.
Minneapolis 15, Minn.

BALDOR BALL BEARING GRINDERS

BUILT FOR HEAVY PRODUCTION SERVICE

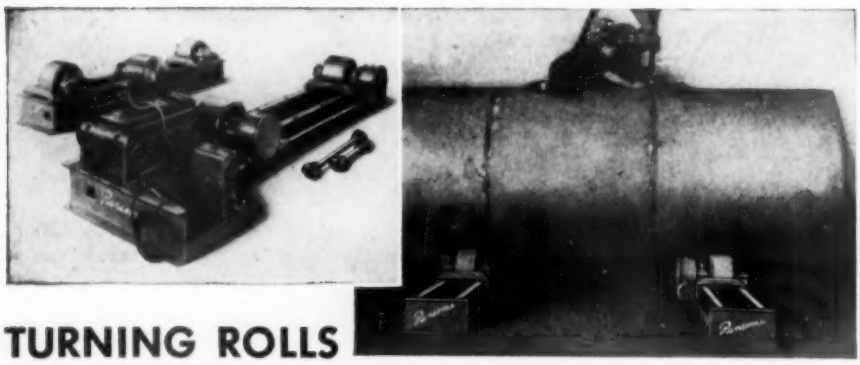
BALDOR Grinder No. 101—built for the heavier production jobs. 1½ hp., ball-bearing motor; 1725 r.p.m., 220, 3-phase, 60-cycle. 10" x 1" Aloxite wheels, exhaust type guards and adjustable tool rests. $90.00

Ask for Bulletin 307

Baldor Electric Company

4335 Duncan Ave., St. Louis 10, Mo.

BUILT BY MOTOR SPECIALISTS



TURNING ROLLS CAN STEP UP YOUR CYLINDER WELDING...

For manual or automatic welding . . . here's the equipment that will enable your welders to produce at their top capacity. Smooth rotation at any desired speed . . . forward or reverse . . . is provided by a variable-speed drive with push-button control.

Work ranging from 2 to 14 feet diameter can be accommodated by shifting the position of the rollers.

Other Ransome Positioners include types and capacities for handling weldments of any size.

POSITIONING PAYS...WRITE FOR LITERATURE

Ransome WELDING POSITIONERS

INDUSTRIAL DIVISION • RANSOME MACHINERY COMPANY • DUNELLEN, NEW JERSEY

Industry's New Tool

Mead Burring Machine

It is a time, labor and money saver on innumerable jobs in any shop. De-burs stampings, forgings, castings; finishes and polishes irregular shapes.

MEAD SPECIALTIES CO.

Dept. 93-T

15 S. MARKET ST. CHICAGO (6), ILL.

HANDY ANDY SAYS—

(Concluded from page 194)

These islands, strategic bases for a potential enemy power, stood as a threat against Swedish security, even as the Aleutians, recently contested, might have become a potential causeway for Japanese invasion of our own Northwest.

Then came the Finnish war, when Swedish resources were badly strained in aiding her unfortunate neighbor. Officially, Sweden remained neutral in that war although many thousands of volunteers fought under the Finnish colors), even as she remained neutral when Norway was invaded.

Why? Well, as minor but provocative considerations, Norway had spurned all overtures for a defensive alliance and, to make matters worse, had been betrayed by Norwegians. Also, Denmark was occupied, making a pattern for division of Scandinavia between Germany and Russia, both powers then being in apparent accord because of the Hitler-Stalin pact. So, keeping a weather eye to the west and south, Sweden trained her guns toward the east. Scandinavia was not to be partitioned!

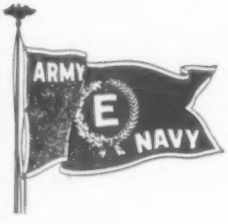
▲ ▲ ▲

That the Russian threat did not materialize is beside the point. It was there, and to all appearances real because Russia was still smarting over Swedish aid to Finland. And, there was the lesson of Poland, partitioned between the two powers, and the retaking of the Baltic states Latvia and Esthonia. Like Finland, those little nations had once been under Swedish cultural influence, and, as a result, enjoyed high social orders. Why share their fate?

Summed up, Sweden is free because she used her head the while giving with her heart. And, while diplomacy was a factor, one must not overlook the moral force of a nation superbly trained and as superbly armed. The Bofors guns are not exactly neutral, as attested by scores of Nazi planes they've brought down over Swedish territory.

And that's a few score less for the Allies to cope with.

THE END



ARMY - NAVY "E" AWARD WINNERS

REFUTING a general belief that Army-Navy "E" pennants are handed out piecemeal, the Under Secretaries of War and the Navy revealed last month that only 1,910 manufacturers had earned the award since its inauguration more than a year ago.

This figure represents about two and one-half per cent of the nation's eligible plants, and shows that the pennant is given only to the select few who can meet the rigid requirements.

An examination of the stiff eligibility standards set up for "E" award candidates discloses why winners prize the recognition so highly. First require-

(Concluded on next page)

A McKinney built three position rotary fixture for drilling and reaming of airplane engine parts.

WITH McKINNEY TOOLING

THE term "in jig time" always implies speed but here at McKinney's it has a dual meaning.

To assure great output of parts profitably, speed and facility of operation are built into every tool, jig and fixture. But these objectives are never attained at a sacrifice of extreme accuracy. Pride of craftmanship is paramount in every department even to uncommonly fine finishing of completed tools before shipping.

McKinney responded to the call for tremendously increased war production with decades of experience as machine designers, tool makers and manufacturers.

Today, the McKinney organization of several hundred engineers and tool makers is shipping tools, jigs and fixtures to both coasts, to Canada and as far south as Texas.

We'll gladly quote on building any tool already designed or have one of our engineers call to discuss problems of tool designing. Call upon us.

McKINNEY TOOL & MFG. CO.
CLEVELAND
DESIGNERS and BUILDERS of PRECISION TOOLING
Since 1920
1671 ARABELLA ROAD
Tools·Dies·Jigs·Fixtures·Special Machinery

(Concluded from preceding page)

ment is that quantity and quality of production be the highest possible in view of available facilities.

Other factors considered are effective management, avoidance of stoppages, maintenance of fair-labor standards, labor-training programs, use of sub-contracting facilities, records of absenteeism, safety and health facilities, and handling of production problems.

If an Army or Navy inspector finds an award candidate up to par on all counts, and the Army and Navy Boards for Production Awards approves his recommendations, the pennant is formally awarded at a short ceremony. Rules ban long-winded speeches, and the entire ceremony must be brief.

Once awarded the hard-won pennant, however, an "E" recipient cannot coast on his reputation. Production records of winners are closely scrutinized every six months, and if production or quality has fallen off and the lag can be charged to labor or management, the award may be withdrawn. This actually has happened in a few cases. One plant managed to regain its award by again meeting the requirements.

If the six-months record shows that a winner has equaled or surpassed the production of the previous [illegible] year, a white star may be added to [illegible] flag.

"E" awards have been made to establishments ranging in size from one to more than 125,000 employees. Of all "E" winners to date, seven per cent have fewer than 100 employees.

★

Recent Citations

AERONCA AIRCRAFT CORPORATION
Middletown, Ohio

AJAX FLEXIBLE COUPLING COMPANY
Westfield, New York

ALLIS-CHALMERS MANUFACTURING CO.
LaPorte, Indiana

AMERICAN CAR & FOUNDRY COMPANY
Berwick, Pennsylvania

AMERICAN TYPE FOUNDERS, INC.
C. H. Cowdrey Machine Works Division,
Fitchburg, Mass.

ATLAS IMPERIAL DIESEL ENGINE CO.
Mattoon, Illinois

BAKER OIL TOOLS, Inc.
Los Angeles, California

THE BELL MACHINE COMPANY
Oshkosh, Wisconsin

BELLE CITY MALLEABLE IRON COMPANY
Racine, Wisconsin

BENDIX AVIATION CORPORATION
Julien P. Friez & Sons Division,
Towson, Maryland

CENTURY BOAT COMPANY
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CHICAGO WHEEL & MANUFACTURING CO.
Chicago, Illinois

COPPERWELD STEEL COMPANY
Glassport, Penn.

DETROIT HARVESTER COMPANY
Dura Division,
Toledo, Ohio

FANSTEEL METALLURGICAL CORPORATION
North Chicago, Ill.

FORD MOTOR COMPANY
Richmond Tank & Motor Vehicle Depot,
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GENERAL MACHINE & MANUFACTURING CO.
Berwick, Pennsylvania

THE HEIL COMPANY
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INDIAN MOTORCYCLE COMPANY
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JACKSON-EVANS MANUFACTURING CO.
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JARECKI MACHINE & TOOL COMPANY
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LINK-BELT COMPANY
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MURPHY ELEVATOR COMPANY
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NATIONAL STANDARD COMPANY
Worcester Wire Works Division,
Worcester, Mass.

THE NEWARK STOVE COMPANY
Newark, Ohio

SILAS MASON COMPANY
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TENNESSEE COPPER COMPANY
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THOMPSON PRODUCTS, INC.
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TRACKSON COMPANY
Milwaukee, Wisconsin

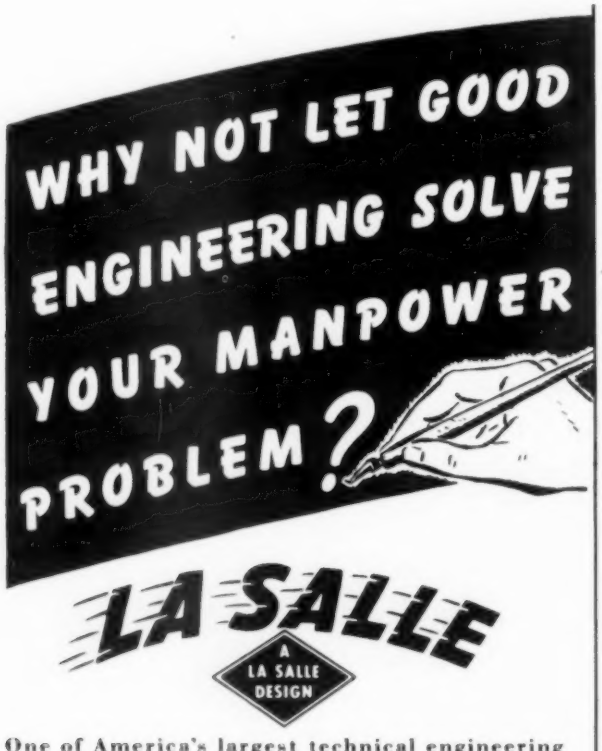
TRUSCON STEEL COMPANY
Pressed Steel Division,
Cleveland, Ohio

UNITED ELECTRONICS COMPANY
Newark, N. J.

UNITED STATES SPRING & BUMPER COMPANY
Vernon, California

WATERBURY CLOCK COMPANY
Waterbury, Conn.

WEST MICHIGAN STEEL FOUNDRY COMPANY
Muskegon, Michigan



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MANAGEMENT ENGINEERING

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★ Process Engineering ★ Product Engineering
★ Designing of Jigs, Tools, Fixtures, Gauges, Dies and Special Machines.

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AMERTORP CORP.
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ATTENTION!

TOOL & DIE MAKERS—SHEET METAL MEN —PATTERN MAKERS—MACHINISTS, ETC.

Speeds layout time on brass, aluminum, copper, tin, stainless steel. Oil Resistant. Won't chip, crack, or flake off. Also ideal as a marking dye for easy identification of metals. Comes in handy 8 oz. bench type brush-in cans. Also pts., qts., gals.

Send for Your FREE SAMPLE Today!

TAMMS SILICA CO.,
228-T North LaSalle St.
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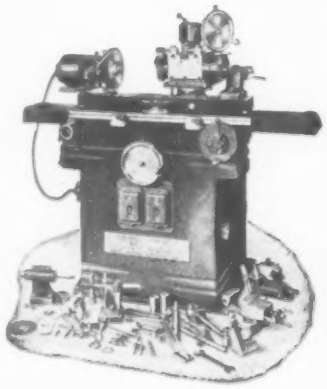
PRECISION THREAD MILLER
FULL AUTOMATIC CONTROL

INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James **COULTER** *Machine Co.*
BRIDGEPORT • CONNECTICUT • U. S. A.

GRAND RAPIDS
NO. 6
UNIVERSAL CUTTER
AND TOOL GRINDER



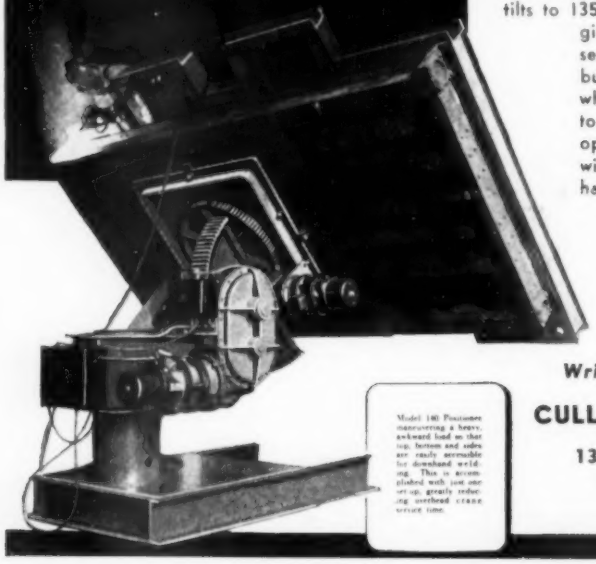
FEATURING
CABINET BASE
BALL BEARING TABLE
FIXED TABLE HEIGHT
BACKED BY 35 YEARS OF EXPERIENCE IN BUILDING PRECISION GRINDING MACHINES.

Bulletin on request

GALLMEYER & LIVINGSTON CO.
110 Straight Ave., SW
GRAND RAPIDS (4) MICHIGAN

THE WELDON TOOL CO. *Cleveland, Ohio*
3000 WOODHILL ROAD

C-F POSITIONERS are Universal Tools



C-F Positioners cut welding time as much as 60%, reduce handling time to a fraction, assure uniformly stronger, smoother welds, and greatly increase out-put per man.

With C-F POSITIONERS you can not only speed-up today's war production, but will be tooled-up to meet after-the-war competition, because each C-F POSITIONER is a ***universal tool*** —is pedestal mounted to give maximum clearance from all sides, is adjustable for height, rotates 360° and tilts to 135° beyond horizontal . . . . gives "a thousand different set-ups" at the push of a button or turn of a hand wheel. Six types, capacities to 30,000 pounds manually operated, motor driven or with variable speed drive for hand or automatic welding.

Write for Bulletin WP 22.

CULLEN-FRIESTEDT CO.

1318 S. Kilbourn Ave., Chicago, Illinois

RACINE METAL CUTTING MACHINES

The Production Saws of Modern Industry

Racine Metal Cutting Machines are hydraulically fed and controlled for smooth "oil-cushioned" operation.

Racine offers a complete range of cutting pressures in either "positive progressive" feed, or in "self-compensating progressive" feed. Progressive feeding produces a true and natural shearing stroke. Saves blades and permits faster cutting.

Racine's complete line includes models for general purpose and production metal cutting, in a wide range of sizes and prices. Capacities 6" x 6" to 20" x 20".

RACINE *Variable Volume* HYDRAULIC PUMPS

A Modern Source of Hydraulic Force

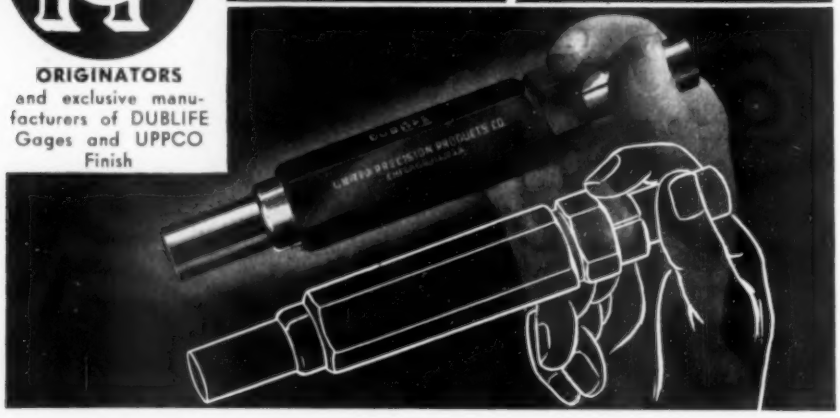
For bending, feeding, molding, holding, pressing and numerous other operations. Pressures of 50 to 1000 lbs. per sq. in. at 0 to 30 gal. per min. HYDRAULIC VALVES—Sizes ⅜" to 1½", with mechanical, electrical or manual operating devices. Request complete information and prices. Address Dept. TE-S.

STANDARD FOR QUALITY AND PRECISION

RACINE TOOL AND MACHINE CO.
RACINE, WISCONSIN

DUBLIFE GAGES *real expediters*

ORIGINATORS and exclusive manufacturers of DUBLIFE Gages and UPPCO Finish



No delays—a new gage always at hand for instant service

DUBLIFE Reversible PLUG GAGES

When one end ***either*** "Go" or "No Go" indicates wear, all you have to do is reverse the plug, bringing ***new*** end into use. Change easily and quickly made. Tapered bronze collet locks plug securely in handle. Dublife insures accuracy ***at all times***—doubles precision life!

Send for Complete Gage Catalog

Shows complete line of UPPCO-lapped DUBLIFE, and other gages of A.G. Design. Full engineering data. Wire or write

UNITED PRECISION PRODUCTS CO.

3517 W. BELMONT AVE. CHICAGO 18, ILL.

FISHER BENDER

This hand-operated bender is made of the best quality malleable iron castings with hardened steel bending blade.

It will bend up to
½" square or round iron,
2" x ½" channel iron,
2¼" x 5/16" flat iron cold.

WEIGHT: 40 POUNDS

Catalog No. 8 on request

T. H. LEWTHWAITE MACHINE CO.

307 E. 47 St. New York 17, N. Y.

—MACHINE TOOLS—

(Continued from page 114)

Order: The WPB's stand on the continued screening of preference rating certificates for machine tools in regional and district WPB offices will effect a rapid reduction in the rate of shipments as the year draws to a close, it was agreed at the meeting.

The effect on machine tool production of the discontinuance of pool orders, which were a substantial factor in providing adequate supplies of machine tools during the period of peak needs, was an important subject of discussion.

Issuance of new pool orders for machine tools has been discontinued following a recent policy decision by the Armed Services and WPB. It was emphasized by the industry representatives that discontinuance of such orders would inevitably force down production still lower, as builders without pool orders will be forced to operate within their own firm order pattern.

The government agency tossed one hot potato into the committee's lap. Compliance action, it was warned, would be taken against companies making shipments of machine tools without proper preference rating certificates as required by General Preference Order E-1-b.

Machine Finishes: The time has not yet arrived, the industry representatives agreed, to restore the use of glossy pre-war finishes on metal working equipment. The original WPB conservation order, the builders still feel, is useful in reducing expenditures of man-hours and materials.

Warner & Swasey Converting; Seeking Post-War Products

Climaxing the Second World War's machine tool boom, Warner & Swasey Company has undertaken the conversion of large portions of its Cleveland plants to the manufacture of a wide variety of war materiel and equipment.

First of the large machine tool builders to reveal the transfer of any part of its facilities to work other than the manufacture of machines, the 63-year old turret lathe builder is acting as subcontractor for 20 companies engaged in war production. Though the company is now in the process of tooling for its new work and contemplated top production is still some time off, it is already turning out parts for a wide variety of weapons and equipment needed for war purposes.

Type of Work: War materiel for which Warner & Swasey is now turning out parts include airplane engines, submarines, diesel engines, power plants for destroyers, torpedoes, jacks for bomb loading, chemical bombs, gun turrets, electric hoists for cargo ships, and motors for lend-lease.

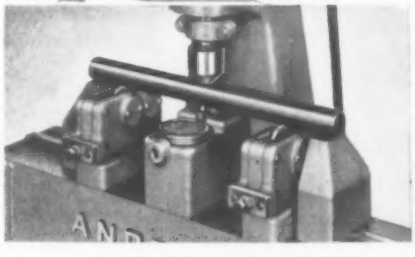
Though tooling is not yet completed, production already is under way on such parts as drive shaft bearings, valves, oil retainers, armature discs, throttling gears, locking pins, poppets, spring holders, blower end plates, cylinder heads, blower housings, bushings, engine blocks, steel cones, pistons, steel cores, hub caps, jacks, steel rings, rotors and spindles.

Charles J. Stilwell, president of Warner & Swasey, said that by subcontract work of this type the Company hoped to be able to maintain continuous oper-

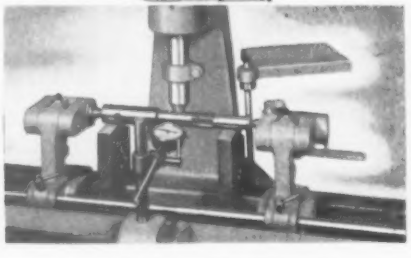
(Continued on page 202)

HYDRAULIC HAND PRESS

For High Speed CHECKING AND STRAIGHTENING



EQUIPPED WITH DISCS



EQUIPPED WITH CENTERS

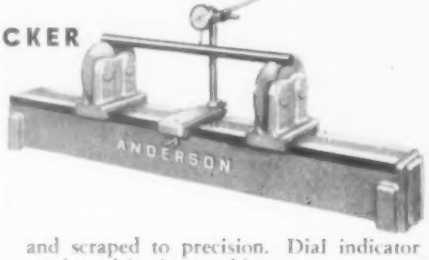
Checks and Bends in Same Position...

Eliminates Moving Shaft from Anvil to Centers for Checking

When pressure is released the spring tension on rolls brings the shaft free of the anvils and free to rotate for checking. Checking rolls are easily adjusted for various shaft lengths and can be removed altogether if necessary. Press is equipped with an indicator gauge calibrated in thousandths of an inch for locating high and low spots on shaft. Also a pressure gauge calibrated in pounds. The exact tonnage required to straighten any shaft can be quickly determined by the operator. This time-saving unit is operated by a hand hydraulic pump with a capacity up to 20,000 pounds.

The Anderson Hydrualic Hand Press is a high production machine that will pay good dividends in any plant where a quantity of shaft straightening operations are performed. Send prints or sample parts for our recommendations regarding size of machine best adapted to your particular needs.

High Speed ROTO CHECKER



Designed for speed and accuracy in checking straight shafting, tubing, and pieces having the same diameter at both ends. The work is mounted directly on discs which rotate on supersensitive ball bearings. Time customarily used for cleaning and conditioning centers is eliminated, also the time for mounting between centers. Balancing can also be handled by this machine. Base is of sturdy design, well ribbed and scraped to precision. Dial indicator graduated in thousandths.

Write for Details to ANDERSON BROS. MFG. CO., ROCKFORD, ILL.

Anderson SHOP TOOLS

New! **A BIG Little Grinder!**

MARSCHKE "In Between" DIRECT-DRIVE Swing Frame Grinder

Fits between heavier swing frame grinders and lighter portable and flexible shaft machines. Has 3 HP., 1800 RPM motor driving a 12" x 2" wheel with magnetic push button control, overload and undervoltage protection, bronze bushed swivel collar suspension with clamp lock, a handle along each side and one above guard. Is 5 ft. long and weighs 300 lbs.

This machine is unusually maneuverable. Operator can angle it in every direction for reaching exposed surface on all sizes and shapes of castings. Work is always in view of operator. Remove guard for grinding internal surfaces and machine is equally practical for reducing weld seams of large plates and other fabricated structures. Ample pressure is conveniently applied to assure metal removal up to full motor and wheel capacity.

★ **THE MARSCHKE LINE** ★

Manufactured and Sold By

VONNEGUT MOULDER CORP. 1820 Madison Avenue Indianapolis, Ind.

Atlas **10" F-SERIES LATHE**

ARMY E NAVY

This is the modern backgeared screw-cutting lathe for war production. It is accurate, powerful, and ruggedly built to stand the punishment of today's production demands. Handles screw machine work when equipped with Atlas turrets and lever-type collet chuck. Send for full details.

ATLAS PRESS COMPANY

914 **N. PITCHER STREET, KALAMAZOO, MICHIGAN**

LATHES · DRILL PRESSES · ARBOR PRESSES · SHAPERS · MILLING MACHINES

MACHINE TOOLS

(Continued from page 201)

ation for the duration of its war-expanded productive facilities.

Post-War: Typical of the machine tool industry, Warner & Swasey threw itself headlong into the struggle to equip the nation's productive facilities in time with the precision metal cutting machines needed for victory.

Without waiting for Pearl Harbor, Warner & Swasey declared its own war in 1939. They increased their turret lathe output seven times normal.

In achieving an almost unbelievable production record, the company has expanded its plant capacity to five times its pre-war size. Such expansion would inevitably pose post-war problems, but Warner & Swasey knew those problems would come to them sooner than to many machine tool builders. As a producer of turret lathes, they were among the first to feel the impetus of war production, and likewise were among the first to note the present decline in machine tool requirements.

The company's energetic president, Charles J. Stilwell, was ready for the decline, now has one of the most progressive post-war planning projects in his industry well under way. Early this year he appointed a five-man post-war

Warner & Swasey photo

Having filled a large portion of the nation's demands for its specialized machine tools, Warner & Swasey is today completing a partial conversion to sub-contracting for 20 concerns on war production.

planning committee to handle the problem of seeking new products and new customers. Although some of the government-financed plant additions might be crossed off as investments in victory, the company believes that as much as possible these facilities should be utilized in profitable production. Warner & Swasey feels it has a responsibility to its present employees and to service men returning from war.

Consequently, it is seeking appropriate outlets for its extensive equipment and trained personnel. Startling the machine tool industry with its progressive and bold approach to a common problem, it is using national advertising to ferret out new business. In its advertising, the company says, "Warner & Swasey wants to talk to men or companies with products or problems—present or post-war."

The company makes it clear, however, that it will be producing machine tools after the war. THE END.

U S HEADS
STANDARD SINCE 1915

30 DIFFERENT STANDARD SIZE ADJUSTABLE DRILL HEADS, CAPACITIES UP TO 1½" DRILLS

SEND US YOUR B/PS

All Types of Fixed Center Heads

UNITED STATES DRILL HEAD CO.
Cincinnati, Ohio

Safe, Adjustable PARALLELS

That Speed Precision Operations...!

★Get rid of the obsolete, dangerous method of slowly building a foundation for drilling, tapping, boring, milling, grinding and other precision operations.

Do it the war-time way . . . the safe and speedy way . . . with Acro ***adjustable*** PARALLELS. They are made in three sizes and handle a wide range of work.

USED IN AMERICA'S BIG WAR PLANTS

These modern PARALLELS have become standard equipment in many of America's leading war plants . . . your assurance that PARALLELS by Acro will do much toward speeding precision operations in your plant. Act now!

See Your Jobber or Write Direct!

ACRO TOOL & DIE WORKS
5329 N. Kedzie Ave. Chicago, Ill.
IRVing 8500
Precision Machinists • Tools • Dies • Metal Specialties

"Hold fast!"

Use ALLENS

WHEN all depends on *holding fast,* you can depend on ALLENS.

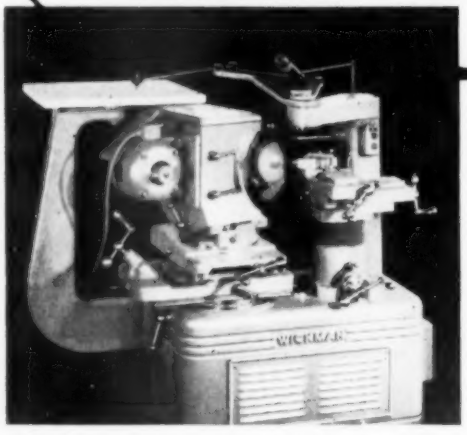
In machines of war and machinery of production, "Allens" hold with a grip that never lets go. For "Allens" wage perpetual war on those enemies of mechanical assemblies: strain, stress, shock, vibration.

Made of strongest adaptable alloy steel, formed and threaded by pressure-processes, "Allens" stand punishing set-ups. Precision-threaded to a high "Class 3" fit, they bear evenly on *all* threaded surfaces in the tapped hole.

By these qualities they resist slippage, defy breakage.

THE ALLEN MANUFACTURING COMPANY
HARTFORD, ★ ALLEN ★ CONNECTICUT, U.S.A.

Today's Wickman PROFILE GRINDER



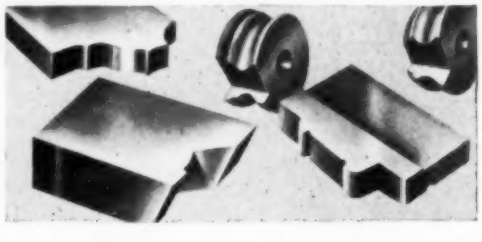
A Machine Backed By YEARS Of Intensive Use In Production

Two years ago, the Wickman Corporation of Detroit introduced to American industry a profile grinder incorporating a fifty to one pantograph for controlling the formation of the profile, and a 30-power microscope for observing development of the profile and for accurate inspection of the work before it is removed from the machine.

Even then, this machine was not a new development. Previously, our associate company, A. C. Wickman, Ltd., of Coventry, England, had many years background not only in the manufacture of the machine but also in its use and application.

After extensive use by a number of this country's best known manufacturers, the Wickman Profile Grinder has proved its exceptional efficiency and accuracy under widely varying production conditions.

The Answer To Your Difficult Contour Grinding Jobs



Profiles similar to these are being ground in tungsten-carbide and other hard metals on this machine without the use of a radius dresser or formed wheel. If you have any unusual or particularly difficult grinding jobs of similar nature, you should become familiar with the possibilities of the Wickman Profile Grinder for use in your plant. We solicit your inquiries.

WICKMAN PROFILE GRINDER

THE Wickman CORPORATION

15535 WOODROW WILSON
DETROIT, MICHIGAN

INDUSTRIAL NEWS DIGEST

(Continued from page 130)

Motor Manufacturing Men: Output Rising; Plastics at Ford Motor

Motor-makers have reason to cheer over their war production record. During the past 12 months the industry has boosted its output more than 80 per cent, has reached an annual production rate of $9,300,000,000.

Pushing Hard: Basing its figures on reports from nation-wide plants, the Automotive Council for War Production says that in July the industry turned out war materiel valued at $775,000,000. That the motor-men are pushing hard is shown by comparison with the June 1943 total of $747,670,000. Output in July a year ago was $427,150,000. Thus, in 12 months, the industry has stepped up its output 81.4 per cent.

* *

Tanks: If any industry ever worked itself out of a job, the auto-makers did in mass-producing tanks. Tackling what previously was regarded as a "carriage trade" job early in the war effort, the automobile industry dug up all the tricks they had learned over the years, put tank manufacture on an assembly line basis. Result: Only two auto makers, Fisher and Chrysler, are still at work on tanks, and the end of their work is within sight.

* *

Packard Expansion: Increased emphasis on aircraft in the war production program is keeping Packard Motor production engineers on the spot. Unable to meet the Army Air Corps' mounting demands for Rolls-Royce engines, the company has opened its first "out-of-town" plant.

Known as the "Toledo Division", the new Ohio city factory was built for use by the Aviation Corporation. As a result of changing war demands, AVCO never got the plant into production on another aircraft job.

Important Rolls-Royce parts, now being produced by Packard at double last year's volume, will be processed and machined in the Toledo Division. "Output will be rolling within a few weeks, and full capacity is expected to be reached before 1944," George T. Christopher, Packard president and production boss said recently.

Promotions: R. R. Rees, Chief Plant Engineer of the company's Detroit factory heads the Toledo operation. Employment, including practically all key positions, will be filled by local personnel. Annual payroll is estimated at $10,000,000. Business volume is expected to top a monthly seven-figure total.

Much of the new machinery used in the Toledo plant's former operation will be converted to Packard production. Additional new tools and equipment now are on order to fill a huge machine shop. "Several hundred parts now machined by Packard in its engine program in Detroit eventually will be processed in the Toledo plant," Christopher said.

K. R. Parker, former construction engineer in the Packard aircraft division, steps up as Chief Plant Engineer in Detroit.

* *

Ford Plastics: Pioneers in the use of plastics, the Ford Motor Company has turned its experience to good advantage in its production of Pratt &

(Concluded on page 207)

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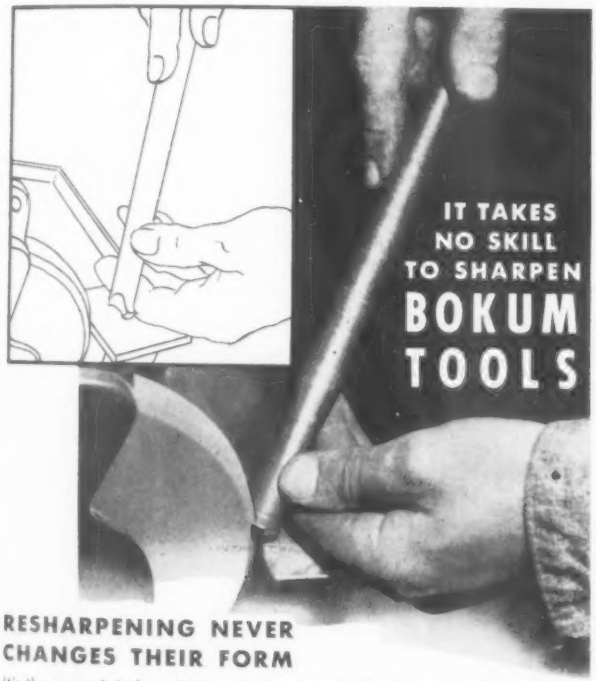

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(Concluded from page 204)

Whitney radial aircraft engines. Ten 500-pound presses which the company used in producing plastic automobile parts now are used in aircraft engine parts manufactured in the Rouge plant at Dearborn.

In these presses Ford engineers have conquered a difficult molding problem and with a new design have developed a superior distributor head, the electrical "brain" of the radial engine. These plastic heads are replacing inferior rubber heads, especially on aircraft operating at extremely high altitudes. Of greater di-electric strength and providing more arc-resistance, the new distributor also is highly moisture resistant.

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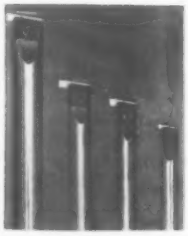

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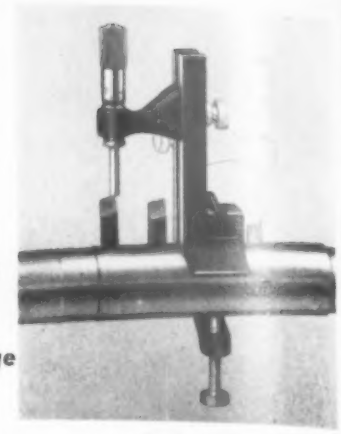

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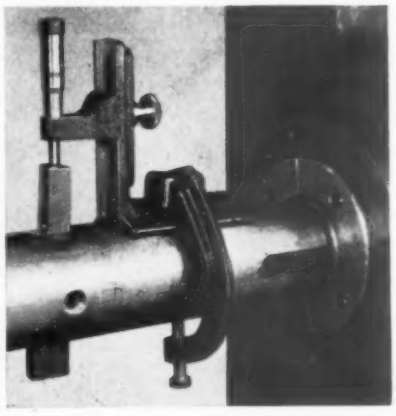

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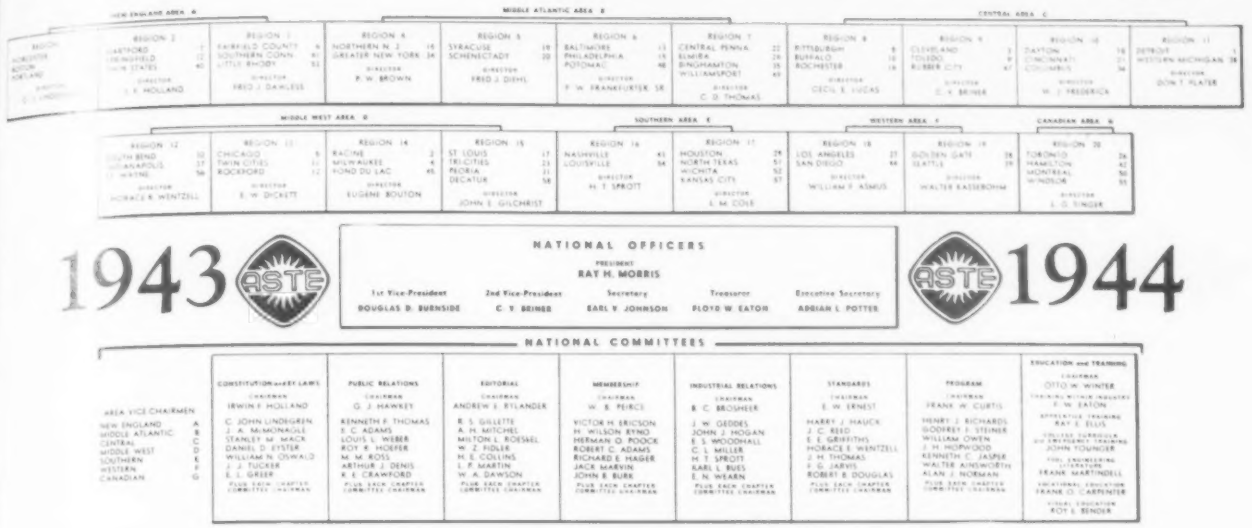

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● For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 2567 W. Grand Boulevard, Detroit, Michigan. Telephone: TY 50145.

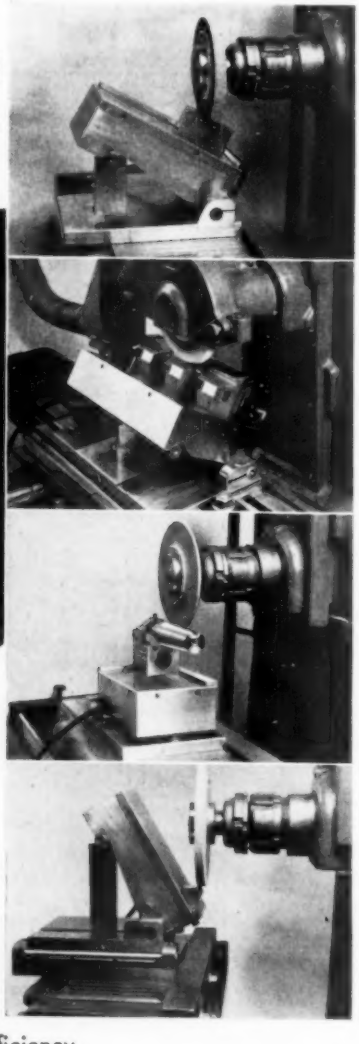
● Senior initiation fee is five dollars. Dues eight dollars per year for senior grade membership and five dollars per year for junior grade membership. Junior initiation fee is two dollars.

A. S. T. E. DOINGS

Atlanta: Plans are going on apace for chartering a chapter at Atlanta. Nearly 50 members have been signed up to date and sponsors are confident a charter will be granted by the National office before the semi-annual meeting in October. When chartered, the chapter will be Number 61.

Dayton: The final outdoor meeting was held August 9 at the Walnut Grove Country Club. Several members indulged in a game of golf before the meeting and picnic lunch at 6:30. Plans were completed for the Fall technical session, which will be held in September at the Engineers Club.

Any ANGULAR GRINDING SET-UP



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In present production, the Magna-Sine not only saves time and money, but reduces to an absolute minimum "down-time" of the grinders on which angular work is done.

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Fond du Lac: Members and their families and friends attended the second annual outing at the Tokodah Club August 15. A full day-length program included golf and other sports.

Arrangements have been made for the next technical session, which is to be held in Fond du Lac Friday night, September 10.

Kansas City: Bakelite Corporation, New York, furnished an interesting film, "Fourth Kingdom", for the August 4th meeting held at Fred Harvey's Pine Room at the Union Station. Also on the program was the regular floor discussion, led at this meeting by Mr. Peterson, public relations chairman.

Carl Milby, working with Mr. Peterson, is making a compilation of the monthly discussions, together with data and drawings. The compilation is to be made up in loose leaf form and each chapter member is to be supplied with a copy.

The semi-annual A.S.T.E. Meeting will be held in Indianapolis October 10, 11, and 12. See the story on page 109 of this issue for details.

Los Angeles: More than 200 persons turned out for the August 12th meeting at Scully's Cafe.

The program was under the sponsorship of the Savage Tool Company. Movies and the procedure for making gage blocks were shown. Also included on the program was a talk on the relation of descriptive geometry to tool design, given by Thomas Linton.

Paul William, noted architect, will speak at the September meeting.

New Orleans: Approximately 50 persons attended the organizational meeting held at the Jung Hotel, August 11, to complete plans for founding Chapter 60.

Nearly 70 members have been lined up and a charter is expected from the National office before the semi-annual meeting in October at Indianapolis.

John W. Eichhorn was temporary chairman of the organizational meeting.

Syracuse Chapter will meet September 14, at 8 p. m. in the Hotel Syracuse. Principal speaker at the meeting will be Dr. H. B. Osborn, Jr., research engineer at the Ohio Crankshaft Company. He will talk on "Tocco High Speed Frequency Induction Heat Treating and Brazing."

Seattle: More than 100 members attended the July 13 meeting held at Crawford's Sea Grill. Profits of $65 from the showing of the film, "The Rape of Nanking", depicting China before and after the Jap invasion, were turned over to the China Relief Fund.

THE END

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Taperlock Plastic
GAGE HANDLES

LIGHT WEIGHT PLASTIC HANDLES give gages more sensitive touch because they are lighter than any metal. They reduce fatigue and insulate gages from bodily heat, safeguarding accuracy.

EASILY MARKED for identification with the same stamps used for marking metal handles.

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IMMEDIATELY AVAILABLE IN 6 STANDARD SIZES and in any quantity.

MADE IN FOUR COLORS, Red, Yellow, Green, Black for quick identification of types or sizes.

IDEAL FOR THE NEW GLASS GAGES. Users and makers find that gages of glass require a lighter than metal handle. This lightness reduces the danger of breakage and also adds to the sensitivity.

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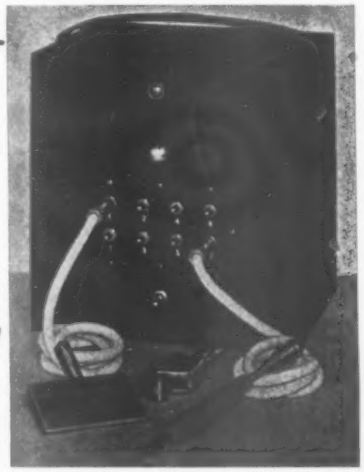

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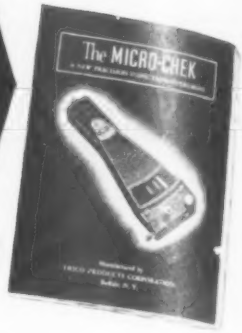

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LOOK AT THESE FEATURES

- Extension pilots for line-up work.
- Cannot fall in slots or oil grooves.
- 35 to 80 thousandths expansion.
- Left and right spirals.
- Full bearing surface.
- Perfect alignment.
- Chrome-like finish.
- Will not chatter.
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AN *All-Electric* ADJUSTABLE-SPEED DRIVE FOR A-C. CIRCUITS

SPEED RANGES up to 16 to 1 — SIZES 1 TO 30 hp.

SPEED CHANGES. Speed adjusted smoothly over wide range while machine is in operation.

QUICK STOPPING. Obtained electrically from speed adjuster handle or stop button.

SLOW FOR THREADING and INCHING. Safe for setting-up and for close inspection in process.

SMOOTH ACCELERATION. No clutches. Smooth acceleration and deceleration to protect light material in motion.

ALSO: A direct space-saving drive; speed-control convenience without limitations; reversing; start and stop without interfering with speed setting; ample starting torque.

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1088 IVANHOE ROAD — CLEVELAND, OHIO
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---for fast, accurate low-cost indexing---

DRILLING • GRINDING • SLOTTING
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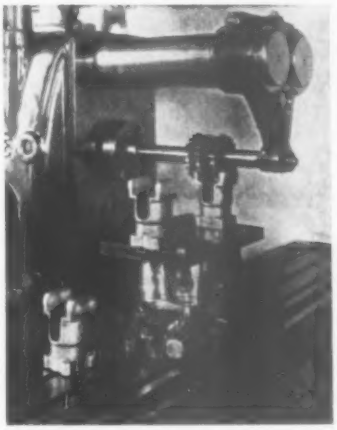

This machine attachment will do a perfect job of indexing for you — even in the hands of an inexperienced operator.

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The "SUPER-SPACER" comes complete with self-centering chuck, reversible jaws, mask plates, and sliding handle chuck wrench.

HARTFORD "SUPER-SPACER"

WRITE TODAY FOR COMPLETE INFORMATION CONCERNING THIS UNIQUE INDEXING FEATURE

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

Columbia TOOL STEEL

SECOND FRONT—

The second home front is production from machine tools. And your machine can produce only as much as the tool that does the work.

P. S. Buy More Bonds.

It pays to use Good Tool Steel.

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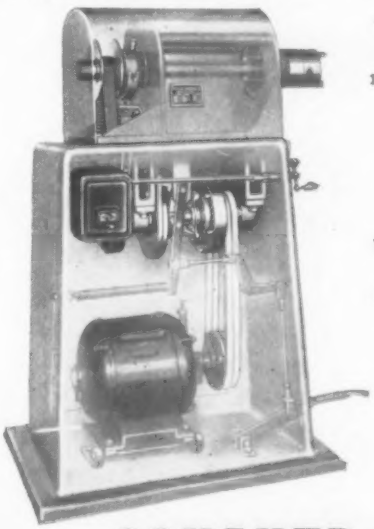

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2066 READING ROAD : CINCINNATI 2, OHIO

THE PASSING PARADE

T. M. REG. U. S. PAT. OFF.

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

George W. Long, vice-president of the Simmons Machine Tool Corporation, Albany, N. Y., was drowned July 22 in Lake George in New York State, according to word received from the company. Fifty-one years old at the time of his death, Mr. Long had been associated with the Simmons Company for more than 30 years. He was one of the first employees hired shortly after the firm was founded in 1910 to rebuild machine tools.

Packer Machine Company, Meridian, Conn., announces that **R. H. Hathaway,** formerly assistant chief engineer for Hammond Machinery Builders, Kalamazoo, Mich., has joined its staff as sales and service engineer. Mr. Hathaway has had several years experience in developing and using polishing, deburring, and buffing machinery.

Carboloy Company, Inc., Detroit, has announced the appointment of **K. R. Beardslee** as vice-president in charge of sales. Mr. Beardslee has been associated with Carboloy for 13 years, the past seven as general sales manager. He is a member of the American Society of Tool Engineers.

K. R. Beardslee
New Carboloy vice-president

Clarence G. Stoll, president of Western Electric Company, rounded out 40 years of service to the organization with the week ending August 7, according to a company announcement. Starting as an apprentice in 1903, after graduation from Pennsylvania State College, he rose to the vice-presidency in 1926 and the presidency in 1940.

Earl L. Ramsey, manager of the Diesel Division of Ex-Cell-O Corporation, Detroit, has joined the staff of the War Production Board at Washington. He will be associated with **R. L. Vaniman,** director of the WPB Automotive Division.

Earl L. Ramsey
With WPB Automotive Division

Mr. Ramsey has had extensive experience in the machine tool field. For many years he was associated with machine tool manufacturers, including

(Continued on page 216)

ABRASIVE
ACCESSORIES

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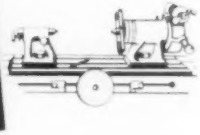
MORE WORK · · BETTER WORK-
FROM YOUR PRESENT MACHINES



Originally designed to increase and improve the work of *Abrasive* Surface Grinding Machines, the Accessories and Attachments listed below are serving efficiently not only on *Abrasive* Machines, but on many other machines of various types. Made to the same high standards as all *Abrasive* Products, they are saving time and boosting production in many machine shops.

EXHAUST ATTACHMENT
WET GRINDING ATTACHMENT
VISE, PLAIN
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RADIUS TRUING DEVICE
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8" INDEX CENTERS
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D. C. GENERATOR *(Belt Drive)*
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HIGH SPEED ATTACHMENT *(Liberty Tool & Gage)*
ROTARY GRINDING ATTACHMENT
12" for Abrasive #34
6" and 8" for Abrasive #3B and #1½

Write for further information and prices on specific equipment

HELP YOUR OPERATORS REDUCE SET-UP TIME AND INCREASE PRODUCTION

ABRASIVE MACHINE TOOL CO.
Dealers in Principal Cities
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SPECIAL

8% Cobalt-Alloyed Super High Speed Steel

TOOL BITS

Long Wearing, Fast Cutting. Try them for that tough job.
Unexcelled for:

Turning Boring Slotting
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Available in Warehouse Stocks.

DARWIN & MILNER INC.
highest grade tool steels
1260 WEST FOURTH STREET
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"YOU CAN TELL BY THE DOT!"

PASSING THE WORD AROUND!

"Threadwell Taps? Sure, they're the ones with the dot. They have stepped up our production and lowered our threading costs."

Thus the word goes around.

Every high speed Threadwell Tap has a dot on the shank—red for cut thread, white for commercial ground, blue for precision ground. In the tool room or on the job, you can tell at a glance by the color of the dot.

And on the job, you can also tell a Threadwell Tap by its superb performance, its accuracy, its stamina. See your Threadwell distributor. He will give "personal attention" to your threading problems.

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"TAPS OF DISTINCTION"

THREADWELL TAP & DIE CO., GREENFIELD, MASS., U. S. A., FOUNDED 1902

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PRECISION · SPEED · ADAPTABILITY

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Warehouses in All Principal Metal Working Centers

New Process Gear Company, Brown, Lipe, and Chapin Company, and Ex-Cell-O Corporation.

New manager of the Nashville division of Consolidated Vultee Aircraft corporation is **J. W. Hennen,** formerly assistant manager of the New Orleans division. He has been an aircraft production executive for 15 years, 11 of them with Boeing Aircraft at Seattle.

R. R. Rees, chief plant engineer for the Packard Motor Car Company's Detroit plant, has been appointed head of the new division of the Packard company at Toledo. He has had 28 years of experience with Packard, having joined the company in 1915 as a construction engineer.

K. R. Parker, former construction engineer for Packard aircraft, will succeed Mr. Rees as chief plant engineer.

Died: **Allan Seymour,** Philadelphia district manager for the Abrasive Division of Norton Company, July 30. Associated with the Norton Company for 25 years, Mr. Seymour had been in charge of the Philadelphia branch since 1934. Prior to that time, he had been manager of the Hartford district and head of the sales engineering department at Worcester.

For Precision and Economy
LIBERTY HIGH SPEED GRINDING ATTACHMENTS
grind slots, recesses and hard-to-get-at surfaces to closest tolerances. There are two models, Horizontal and Vertical . . . each can be assembled to many types of grinders . . . assembly time may not exceed two minutes.
LIBERTY TOOL AND GAGE WORKS, INC.
233 GEORGIA AVE. PROVIDENCE, R. I.
With Plant Facilities for Producing Precision Aircraft Parts
Tomorrow's Tools for Today's Tasks

R. R. Morrison, works manager for the Dodge Main plant in Detroit, was informally honored for his 33 years of service with the organization at a dinner on July 16. Mr. Morrison joined

R. R. Morrison
A third of a century with Dodge

the Dodge organization in 1910 as machinist, assembler, and tester of experimental motors. He received successive promotions, his latest being appointment as works manager in March, 1942.

Tracy Langdon has resigned as vice-president and sales manager of the Stuart Oil Company, Chicago, to become associated with the American Oil and Supply Company, Newark, N. J. He had been connected with Stuart Oil for 23 years, the past 14 years as vice-president and sales manager. His position with American Oil will be in an executive capacity.

William B. Corbett has been appointed plant engineer by Willys-Overland, according to a company announcement. He formerly was associated with Ford,

William B. Corbett
Willys-Overland plant engineer

Hupmobile, and Chrysler in various engineering capacities.

Mr. Corbett is credited with installation of the first conveyer system assembly plant for manufacturing bombers at the Chrysler Graham-Paige plant. In 1928, he laid out and built the Willys-Overland assembly plant at Los Angeles.

C. R. Osborn has been elected a vice-president of General Motors Corporation and will be in direct charge of the Electro-Motive Division at LaGrange, Illinois, according to an announcement from **C. E. Wilson,** president of Gen-

(Continued on page 218)

SPEEDS PRODUCTION! CUTS TIME AND COSTS!

SPEEDY AIR VISE

FAST! POWERFUL!
FOOT CONTROLLED!

$24

Complete with Foot Control Valve, Air Hose and Fittings

HAND FREE OPERATION!

* Foot operation leaves BOTH hands free for fast insertion and removal of work. Vise stays open or closed without constant foot pressure.

Most important vise design in years! A fast-action, hard gripping air vise that speeds production; saves time, labor and costs! Speedy Air Vise operates from air line or individual compressor, exerting a grip of 15 times air pressure! Jaw opening adjustable up to a maximum of 3 inches. Maximum travel of 1/2 inch assures rapid insertion and removal of work. Employs no piston, but instead a long-life, multiple-type diaphragm . . . eliminating friction loss, air leakage and slippage. Rugged, compact, low priced, it is the ideal vise for speeding up numerous operations.

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SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

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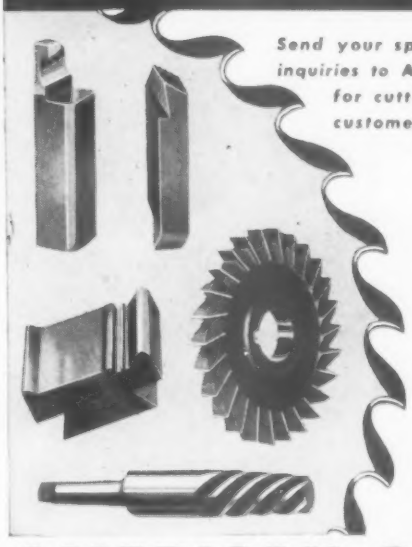
MOLINE, ILL., Sterling Products Co., Inc.
MONTREAL, CAN., Dominion Merchants, Ltd.
NEW ORLEANS, LA., Metal Goods Corporation.
ST. LOUIS, MO., Metal Goods Corporation.

CERRO DE PASCO COPPER CORPORATION

40 WALL STREET - - NEW YORK, N. Y.

HEADQUARTERS for SPECIAL CUTTING TOOLS



Send your special cutting tool inquiries to A.C.E.—headquarters for cutting tools made to customer's prints.

We have modern machinery and equipment, modern methods, trained operators and the "Know How" to turn out special cutting tools that meet your requirements in accuracy, precision and workmanship. Note: We make no tools for stock.

Send us your immediate needs for prompt inquiries. Bulletin on request.

Certain desirable territories still available for active representatives.

AMERICAN CUTTER & Engineering Corp.
31751 Mound Road,
Warren, Mich.

AMERICAN CUTTER

AND ENGINEERING CORP., WARREN, MICH.

SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

THE IMPROVED NIELSEN LIVE CENTERS

★

Load capacity 200 to 40,000 lbs. at 100 rpm.

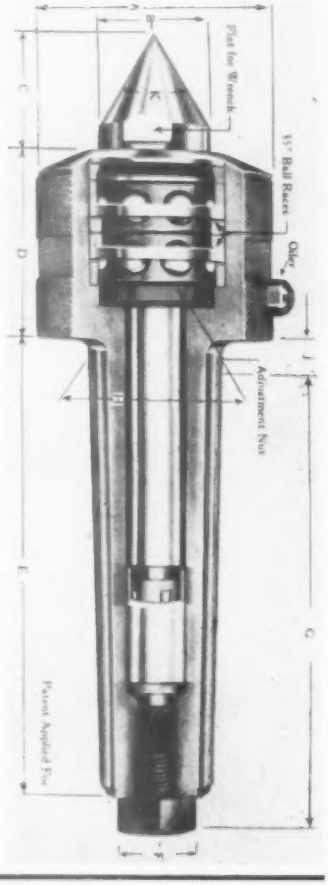
Have adjustment to take up wear and preload bearings.

•

Standard Morse Taper No. 2 to 6 in stock

★

WRITE FOR CATALOG



NIELSEN
INCORPORATED
LAWTON • MICH.

eral Motors. Mr. Osborn has been associated with the corporation since 1921.

Another General Motors shift in personnel has placed **E. B. Newill** in the post of general manager of the Allison Division at Indianapolis. **F. C. Kroeger**, previous manager at Allison, has been granted a leave of absence because of illness.

Aviation Corporation announces the transfer of **William B. Griese** from plant manager of the Liquid Cooled Engine Division, Toledo, to plant manager of the Spencer Heater Division, Williamsport, Pa. Prior to his tenure at Toledo, Mr. Griese was plant manager of the Lycoming Aircraft Engine Division of the Corporation.

H. A. Weissbrodt has resigned as deputy director in charge of the production service division of the WPB Detroit office. He has returned to International Harvester Company at Chicago to undertake an important special assignment in connection with the company's war production program.

A. C. Ryan, formerly assistant to Mr. Weissbrodt, has been appointed to fill the post of deputy director. He has been with the WPB since November, 1942, serving as assistant to the director general for operations in Washington. His new duties will include supervision over the production facilities and salvage departments, the power section, and material distribution.

Follansbee Steel Corporation, Follansbee, W. Va., announces appointment of **Robert W. O'Neal** as industrial engineer in charge of methods and standards. He formerly was associated

Robert W. O'Neal
Engineer for Follansbee Steel

with the industrial engineering departments of the Carnegie Steel Company and the Carnegie-Illinois Steel Corporation.

Frederick P. Wessolek, general superintendent of the Ohio Crankshaft Company, died recently at Cleveland. He was 56 years old. The first employee of the company, Mr. Wessolek advanced from machine operator in 1920 to general superintendent at the time of his death.

Dewey C. Harvey recently was appointed chief plant engineer for the Osborn Manufacturing Company, Cleveland, according to a company announcement. In his new post, he will

Dewey C. Harvey
Osborn's chief plant engineer

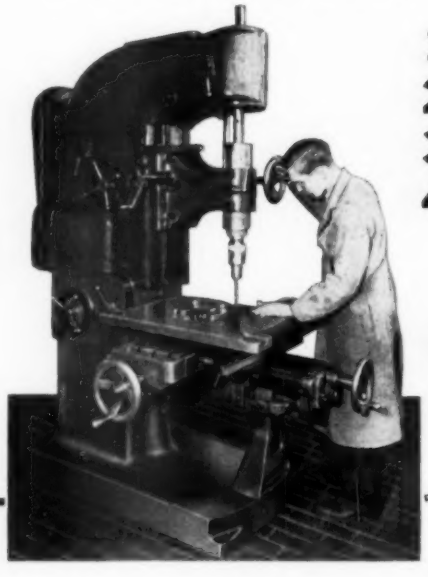
have charge of both the industrial brush and moulding machine divisions.

George R. Murray has been named vice-president of the Chambersburg Engineering Company, Chambersburg, Pa. He also will serve as works manager.

The company also has announced the appointment of **Edgar S. Hutton**, formerly with Clarke Harrison, Inc., as vice-president and treasurer to succeed **S. L. Peterman, Jr.**, who resigned. He also has been named a director.

(Concluded on page 224)

THIS WAR-WORKER HAS A FOUR-FISTED MACHINE



1. Rigidity
2. Accuracy
3. Speed
4. Power

THE KNIGHT MILLER

In the illustration the machine is drilling holes in a large die plate prior to boring. No preliminary layout is necessary because a dial indicator is used to locate holes.

● RIGIDITY, ACCURACY, SPEED, and POWER — all are assured with this universal vertical Knight milling machine. It produces more work, requires less equipment, eliminates hours of layout, and produces quality results. Such features make the Knight Miller a time-saver and a profit-maker.

The construction of the unique table unit, which swivels around the column and tilts either side of horizontal, is just one feature which makes this machine so outstandingly versatile. Without special equipment it can quickly and accurately machine difficult and unusual parts. Write today for complete information on this versatile miller.

W. B. KNIGHT MACHINERY CO.
3920 WEST PINE
SAINT LOUIS, MO.

36 Years A Builder of Quality Milling Machines

HIGH-PRESSURE PERFORMANCE THAT REQUIRES NO HIGH-PRESSURE SELLING

TUTHILL MODEL CK PUMPS GIVE YOU THESE ADVANTAGES

Actions speak louder than words with Tuthill Model CK high-pressure pumps. Designed for service on machine tools, engines and hydraulic mechanisms, these positive-displacement, internal-gear rotary pumps save space, time, material and money, due to their compact design and efficient operation. Furnished with direct motor drives, V-belt units and integral drives in capacities from 1 to 50 g.p.m. and pressures up to 400 p.s.i.

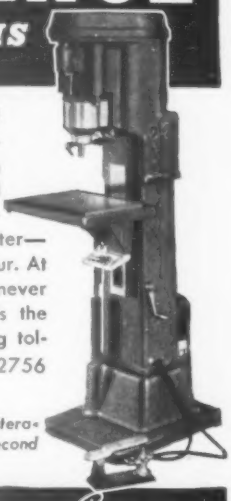
Write for Tuthill Catalog on pumps for production machinery and scores of war-time applications.

TUTHILL PUMP COMPANY

939 EAST 95TH STREET • CHICAGO, ILLINOIS

Second Operation Tapping

THE ANSWER TO TOLERANCE PROBLEMS



ARE YOUR automatics overloaded? Are you having trouble meeting tapping tolerance specifications? Then look into Second Operation Tapping! On specialized Haskins Tappers, critical tapping can be done faster—better—at less cost per man and machine hour. At less tap replacement expense. There's never a tolerance problem, for air controls the accuracy of the work. Within amazing tolerance limits. R. G. Haskins Company, 2756 W. Flournoy St., Chicago.

Send for TAPPING TIPS—new literature that gives money-saving second operation tapping ideas.

HASKINS

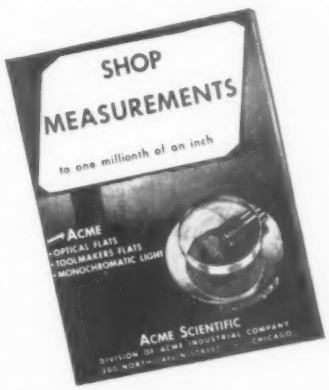
HASKINS *Precision* TAPPING EQUIPMENT

NEW BOOKLET

Describes

LIGHT WAVE MEASUREMENT

★



IT'S YOURS FOR THE ASKING . . . !

Just off the press . . . Acme's new booklet "SHOP MEASUREMENTS to one millionth of an inch", describes in simple detail how Acme Optical Flats are applied in the procedure of lightwave measurement.

Illustrations and diagrams show how these flats can be used to check surface flatness, as well as their use for accurate comparison measurement in connection with precision gage blocks.

In short, this new booklet has been written in non-technical terms to make it easy for the average mechanic to thoroughly understand how to apply lightwave measurement in shop practice.

Write for Your Copy Today . . . !

ACME

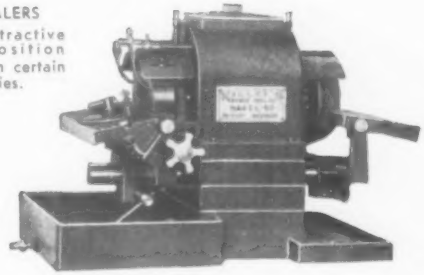
ACME INDUSTRIAL CO.

Makers of Standardized Jig and Fixture Bushings

208 N. LaSalle St. MONroe 4122 Chicago, Ill.

WILLEY'S NEW BENCH TYPE GRINDER

DEALERS
An attractive proposition open in certain territories.



The new Model 50 is compact, designed for rapid, economical wet or dry grinding of tungsten carbide tipped tools as well as other types of tool bits ranging up to a maximum of 1¼" square or equal cross sectional area.

A precision grinder built for accurate work, capable of real production. Available with pedestal base if desired.

WRITE FOR FOLDER

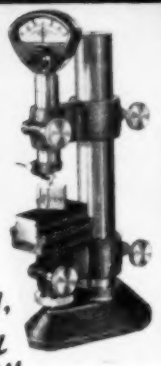
Contains complete specifications of Model 50 and other models.

WILLEY'S CARBIDE TOOL CO.

1340 W. Vernor Highway, Detroit, Michigan

MIKROKATOR
"MIKRO" (MINUTE)

FRICTIONLESS AMPLIFICATION



NO
RACKS.
GEARS.
LEVERS.
LAG OR BACK LASH.
ELECTRICAL CONNECTION

Graduated—.0001" to .00001"; .001mm to .0002mm.

Positive, dependable, repeat readings assured . . . . Pointer responds instantly to slightest movement of measuring tip without swinging past true reading. No waiting for pointer to come to rest. Effects of vibration neglible owing to light weight and absence of inertia. Complete assembly of instrument and stand light enough to be easily carried to different locations in shop.

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PROCESSES AND EQUIPMENT FOR

HOLES
Engineered to Product and Plant

We can help with YOUR HOLE PROBLEMS

HOLE ENGINEERING SERVICE
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are used on—

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and are used for—

Grinding . . . Precision Boring . . . Machining and other operations on Spur . . . Internal . . . Bevel . . . Cluster . . . Helical and Herringbone Gears.

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MACHINE WORKS, INC.
DAYTON OHIO

We do not know of a plant in this Country which has won the "E" Pennant and which has not used our service.

NATIONAL TOOL SALVAGE CO.
6511 Epworth Blvd.
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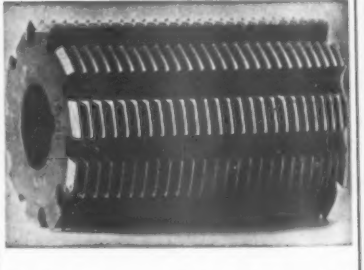
THREAD MILLING HOBS, COMBINATION CUTTERS & CIRCULAR THREAD CHASERS

Class 1, 2 or 3 fit in any thread system and thread angle

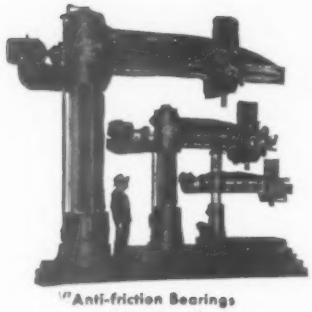


Shell hobs up to 7" O.D. and 5" width, Taper shank hobs to 12" overall length.

ALSO RADIAL RELIEVED END MILLS

FIRST SHIPMENT WITHIN TEN DAYS ON ORDER OF MORE THAN 25 ITEMS

U. S. MACHINE TOOL MFG. CORP.
Clinton, Ind. Phone 85



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL FEATURES—

1—LOW HUNG DRIVE TO THE SPINDLE
2—ALL POWER DRIVEN PARTS RUNNING IN OIL
3—QUIET RUNNING AT ALL SPEEDS
4—CONCENTRATED AND CONVENIENT CONTROLS
5—CONSTRUCTED ON UNIT PRINCIPLE

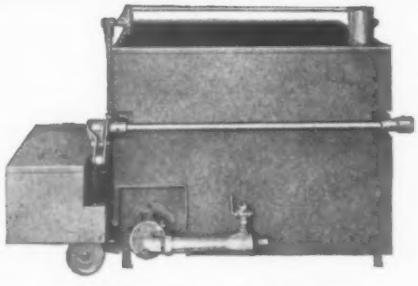
THE

CARLTON

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U.S.A.

METAL PARTS CLEANING
Low Cost — Efficient



STURDY-BILT "*Simplex*"
METAL PARTS CLEANER

A small compact, mechanically simple unit combining ACTIVE-SOAK with WASHING ACTION. Removes oil, grease, chips from metal parts, assemblies castings, etc.

Operator simply loads tray—presses a switch and the "Simplex" does the rest. Can be installed individually in different departments or in a series for consecutive steps of cleaning, rinsing, coating or treating.

NOW . . . S-B DRYERS for complete installations of cleaning and drying parts.

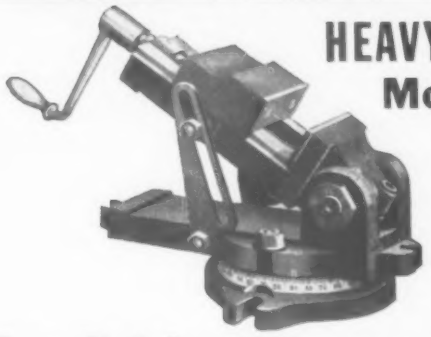
Write for complete information.

STURDY-BILT EQUIPMENT CORP.

Dept. T9, West Allis, Wisconsin

Also manufacturers of "Sturdy-Bilt" Soaker-Hydro continuous production metal parts cleaners.

PALMGREN
ANGLE VISES



HEAVY-DUTY Model

For Quick — Accurate Set-ups

PALMGREN Heavy Duty Angle Vises are built sturdy and rugged for tough, heavy jobs. They are accurately graduated in degrees, can be quickly adjusted to any angle, stay locked under severe service and save valuable hours otherwise wasted in tedious make-ready, wedging or making temporary jigs and fixtures.

Jaws are hardened and ground. Special outstanding features are the size and opening of jaws—4" Jaws open full 4"; the 6" Jaws open full 6" etc., with corresponding depth of Jaws. Vise can be used as ordinary vise when lowered to horizontal position. Swivel bases furnished if desired. Sizes 4", 6" and 8" Jaws and openings. Prompt deliveries.

Write for Bulletin P-8 "101 Angle Operations" and complete line of PALMGREN Vises

CHICAGO TOOL & ENGINEERING CO.

Mfrs. of PALMGREN PRODUCTS for over 25 years

8391 SOUTH CHICAGO AVENUE • • • CHICAGO

PRECISION WORK AT ANY ANGLE

BLOWS
CUSHIONED
with
Rawhide
HAMMERS
and
MALLETS

Coiled Rawhide faces strike *effective* blows without marring or battering; speed up work; reduce spoilage. Hold true faces—strike accurately. Outlast several ordinary mallets. Reduce bounce and recoil—prevent fatigue. All sizes with light or weighted heads. Write for Catalog.

Replacement insert faces for C/R Hammers sold by leading supply houses.

CHICAGO *Rawhide* MFG. CO.

1393 ELSTON AVE. ★ CHICAGO, ILLINOIS.

SCREW MACHINE CAMS
for
B & S MACHINES

Cams cut to your layout shipped within 2 to 3 days.

Set of 3 No. 00 Cams including blanks, cutting, heat treating — $6.20 complete. Other sizes in proportion.

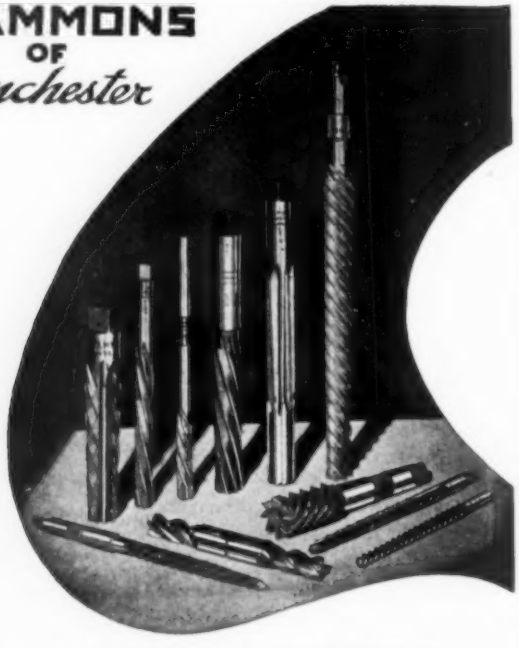
GEORGE L. DETTERBECK CO.
1871 CLYBOURN AVENUE
CHICAGO, ILL.

Magni-Ray

The new illuminated magnifier will aid in solving your inspection problems. Used for inspection and examining work for burrs, flaws in workmanship, surface defects, cracks in castings, blow holes, imperfect welding seams. Light shines on work, no reflection in eyes of operator. SPEED UP INSPECTION WITH MAGNI-RAY.
INVESTIGATE!
Wherever you now use ordinary magnifiers, try the ILLUMINATED MAGNI-RAY, and compare results. Write today for folder describing both models.
MADE IN 2 MODELS
Model A with 3" lens complete with stand $18.50
Model B with special 2" achromatic lens complete with stand $27.50

GEORGE SCHERR CO., INC.
132 Lafayette Street **New York, N. Y.**

GAMMONS OF *Manchester*



PRODUCTION TOOLS

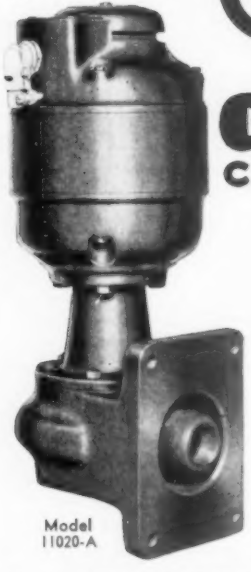
ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

HIGH FLUSHING CAPACITY

with

GUSHER
COOLANT PUMPS



And yet, you can cut down the flow to a mere dribble without building pressure.

Gusher Coolant Pumps are being used by leaders in the industry for grinding, honing, cutting, milling, tapping and threading.

Learn the exclusive advantages of Gusher Coolant Pumps. Sizes and types from 1/10 to 2 h. p.

Write for data and specifications.

THE RUTHMAN MACHINERY CO.
1815 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

Send for Valuable Booklet

Forgings For All Industries
Rough Turned or Finished Complete

Composite Die Sections
Extrusion Tools
Crankshaft Forgings
Gear Forgings
Die Casting Dies

Rings, Discs, Blocks Shafts, Hubs, Bars, and Special Shapes. Tool Steel of all Makes
S.A.E. and N.E. SPECIFICATIONS
Stainless & Copper Forgings
May we Serve You?

AJAX STEEL & FORGE Co.
205 ADAIR STREET — DETROIT, MICHIGAN

Use Them Over and Over

DE-STA-CO ARBOR SPACERS

Measured by the number of times they can be used, De-Sta-Co Spacers are the lowest in cost of any spacers you can buy. Made of metal, they are not affected by oil or heat. Use these spacers for quick set-up of milling machine cutters and wherever low cost, accurate spacing is required.

Stock sizes .001" to .125" thick. Specials, any length, cut from bar stock, ground to decimal.

TRIAL ASSORTMENT—enough for average use on one machine sent for $1.00. Give arbor size. *Size and price list sent FREE!*

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Established Over 25 Years
356 Midland Ave • Detroit, Mich.

REID All Electric Automatic Feed Surface Grinder No. 2B

Equipped with Motorized Spindle

A Proven Product for Over a Quarter Century with Thousands in Use Daily

Send for Descriptive Literature
EXCELLENT DELIVERIES

Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

OF DUST HAZARDS..

Don't allow dust to *air raid* your plant, menacing employees' health and efficiency, and destroying your valuable machinery. Sound the "All Clear" by installing TORIT Self-Contained, Portable DUST COLLECTORS. They trap dust instantly at the source, economically and efficiently.

NOTE: Silicosis is oftentimes caused by abrasive dusts. Protect your employees from this hazard.

Inquire further about the advantages of Torit Dust Collectors.

TORIT MANUFACTURING COMPANY
281 WALNUT STREET
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TORIT Dust Collectors
SELF-CONTAINED UNITS

need furnaces Now? CALL

Johnson

FOR 2 WEEKS' DELIVERY

No. 575 Pot-Hardening and Melting Furnace

$315 F.O.B. Factory (Blower Extra)

- Lid-lifting mechanism easily raises cover. Locks in UP position.
- Heavily insulated — 4½" firebrick, backed up with 3½" insulating block.
- Steel Pot 14" wide, 20" deep.

Burners are located near top of combustion chamber, to insure longer pot life. Vent damper regulates flow of exhaust gases. Semi-concealed piping. Large blower assures maximum performance.

No. 120 HI-SPEED STEEL Heat-Treating FURNACE

$129.50 F.O.B. Factory

Firebox 5" high, 7¾" wide, 13½" long.

Use for hi-speed steels or for hardening dies, tools and punches. A sturdy, dependable unit, refractory insulated thruout. Order Now for 2 weeks' delivery.

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Johnson Gas Appliance Co.
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Please send me Free new Johnson Catalog, showing furnaces immediately available.

Name .....

Address .....

City .....

State .....

PASSING PARADE

(Concluded from page 218)

Fort Wayne Works of the General Electric Company announces appointment of **Harold D. Kelsey** as assistant works manager.

Fred E. Harrell has been promoted from assistant chief engineer at Reliance Electric & Engineering Company, Cleveland, to chief engineer, reporting to A. M. MacCutcheon, engineering vice-president. He has been associated with the company since his graduation from Purdue University in 1924.

THE END

CLASSIFIED ADVERTISING

THE TOOL ENGINEER
2842 W. Grand Blvd. Detroit, Mich.

PRODUCT WANTED

Wanted: A product or machine that has a definite post-war market and can be manufactured by a modern tool room. Our organization has the necessary Engineering, Sales, and Advertising departments to develop and merchandise. Write Box 782, THE TOOL ENGINEER.

SITUATIONS AVAILABLE

Machine Designers ATTENTION

Excellent opportunity for designers to associate with nationally known concern engaged in war work. Prior to the war, we pioneered automatic equipment for civilian use. This equipment is now being used to supply the armed forces as well as war plants, shipyards, and arsenals. This before-the-war development has a tremendous future after the war and additional lines of equipment are being added.
For immediate personal interview, send name, complete address, and phone number to Box 780, THE TOOL ENGINEER.

TOOL DESIGNER

Prominent mid-west manufacturer needs tool designer for jigs and fixtures. Must be able to specify machine sequences, etc., for producing portable tools. Regular products are essential to war effort. Post-war prospects excellent, assuring permanent opportunity in modern plant under ideal working conditions. State experience and be prepared to secure certificate of availability. Write to Skilsaw, Inc., 5051 Elston Ave., Chicago 30, Illinois.

Wanted: Tool and die designers thoroughly experienced in the design of tools for sinks, washing machine tubs, and similar products. 100% war work now, excellent post-war opportunities with 60 year old concern in Chicago, Ill. Write giving your complete industrial record to Box 779, THE TOOL ENGINEER.

SITUATIONS WANTED

Wanted: Translating, Russian. Competent translation of English into correct Russian by native born and educated Russian. Expert at mechanical translation. Trained engineer. Excellent references. Write Box 777, THE TOOL ENGINEER.

Tool engineer, age 40, with varied experience and proved ability, desires supervisory position with aggressive post-war company. Box 778, THE TOOL ENGINEER.

LAPPING COMPOUND

Grade No. 38-900A

A NEW compound with a NEW abrasive sharp enough to lap and polish hardened materials, nitrided, chrome plate, etc. Gages, Dies, Aviation parts—yet fine enough for the final finishing.

This compound has a special heavy oily paste base especially made for dilution with spindle oil, kerosene, sperm, etc.

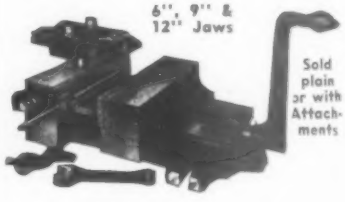
Hand Plate Machine Lapping

Glass jar samples upon request

United States Products Co.
518 Melwood St.
Pittsburgh, Penna.

*Recommended for use on Norton Lapping Machines

GRAHAM MULTI - PURPOSE VISE



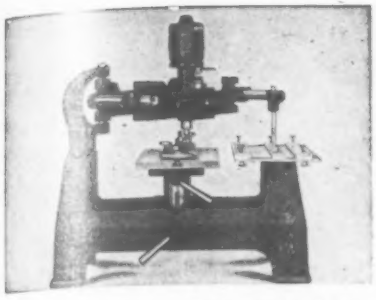
Drilled to receive special jaws, stops and guides, this vise serves a multitude of uses for which a special jig or fixture would otherwise have to be made. Also a fine plain vise for drill press, radial, miller, shaper, planer or grinder.

KNURL HOLDER FITTING LATHE TURRET

Adjustable to produce straight, spiral and checkered knurling, from the same pair of straight-cut knurls. Capacity 2½" dia. Shank made to fit your machine.

Request Illustrated Price Circulars

GRAHAM MFG. CO.
72 BRIDGE ST., EAST GREENWICH, R. I.



For Pantographic Marking
ENGRAVING
ACID ETCHING
ELECTRIC ETCHING
This machine does all three

A compact precision bench-type pantographic machine, with interchangeable heads . . . for engraving instrument dials, name plates, etc. . . . and for acid etching or electrically marking tools and parts—heat-treated or annealed—on flat, concave, or convex surfaces.

Illustration shows machine with engraving head attached.

Write for Literature

H. P. PREIS ENGRAVING MACHINE CO.
181C SUMMIT ST. NEWARK, NEW JERSEY

These sheets show you many ways in which you can use steel bars, plates, sheets, angles, channels, beams, pipe, tubing and flame cut sections to cut costs with welding. Every engineer should have them. Initial installment FREE. Ask for them.

HOBART BROTHERS CO.
Box TE-93 TROY, OHIO

HOBART
"Simplified"
arc welders

"One of the World's Largest Builders of Arc Welders"

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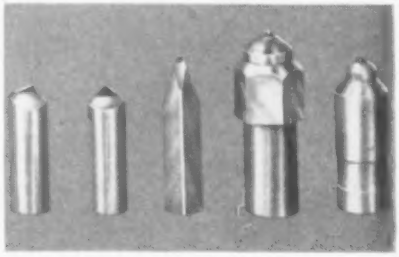

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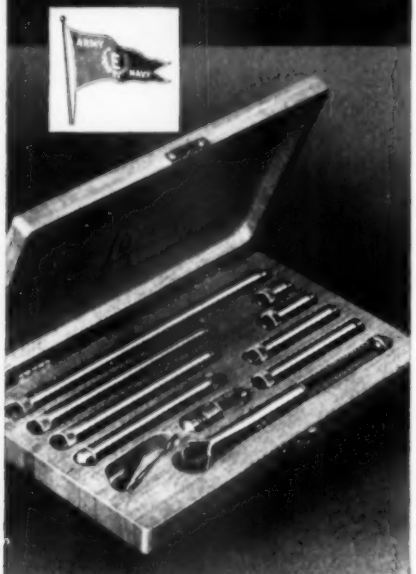

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Collet Index Fixture with
Sub-Base and Tailstock for
PRODUCTION WORK

SPECIFICATIONS

Take standard 1" capacity 5C HARDINGE Collets. Available with either a 20 or 24 hole hardened and ground index plate The sub-base is 24-½" x 5-⅛".

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Time and time again, you have experienced the need for a fixture to quickly hold work **accurately** and, at the same time, provide a means for indexing. HARDINGE Collet Index Fixtures fulfill those requirements **economically** and there is planned interchangeability of the various units for application to a wide variety of work.

These fixtures are for direct application or for use with the sub-base on your milling machines, grinders, shapers and drill presses. The index head shown above with sub-base and tailstock can be used in a horizontal or vertical position, the index plate has preselector screws so that holes not required for a particular job can be "blinded". The lever facilitates chucking of work on a production basis.

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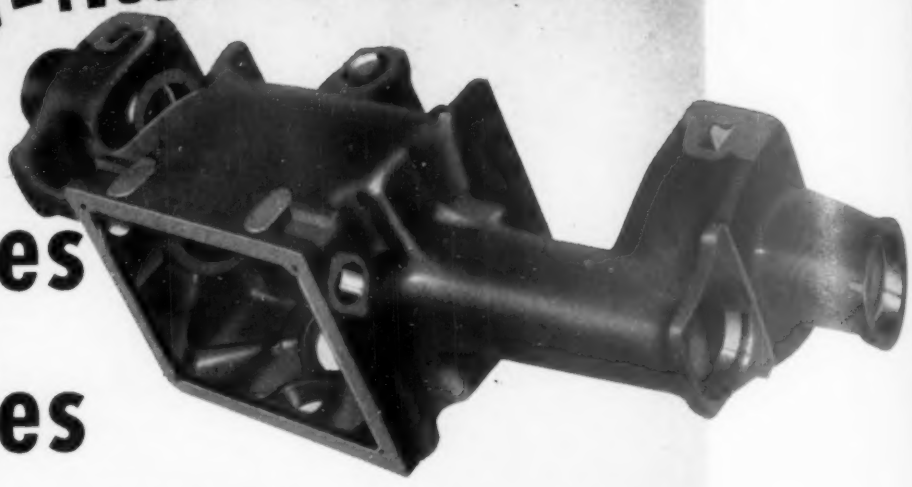
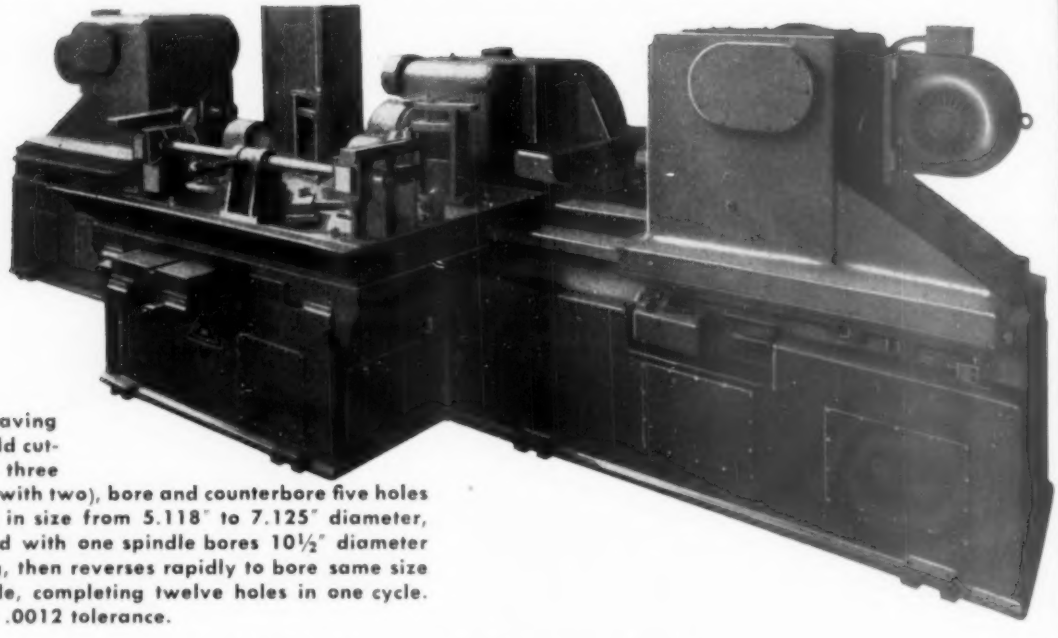


10 holes
5" to 7" in dia.

and 2 holes
10½" in dia.

BORED AND COUNTERBORED IN THIS HUGE DIFFERENTIAL AND FINAL DRIVE HOUSING ON THIS NEW LE MAIRE HYDRAULIC

3-WAY BORING MACHINE



The two end heads, having two spindles each hold cutter arbors (one with three cutters and the other with two), bore and counterbore five holes at each end, ranging in size from 5.118" to 7.125" diameter, while the center head with one spindle bores 10½" diameter hole in large bearing, then reverses rapidly to bore same size hole on opposite side, completing twelve holes in one cycle. All work held within .0012 tolerance.

This is another example of the unusual machines that are engineered and built here at Le Maire to meet difficult situations—how we have enabled manufacturers to speed up their production by having one machine perform work that formerly required batteries of machines to do the same job.

Do you want more production? Perhaps the development of a higher capacity machine—one doing several things at once—is what you should have. Would you like to have us study your problem and suggest an answer?

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LeMaire TOOL & MFG. CO.

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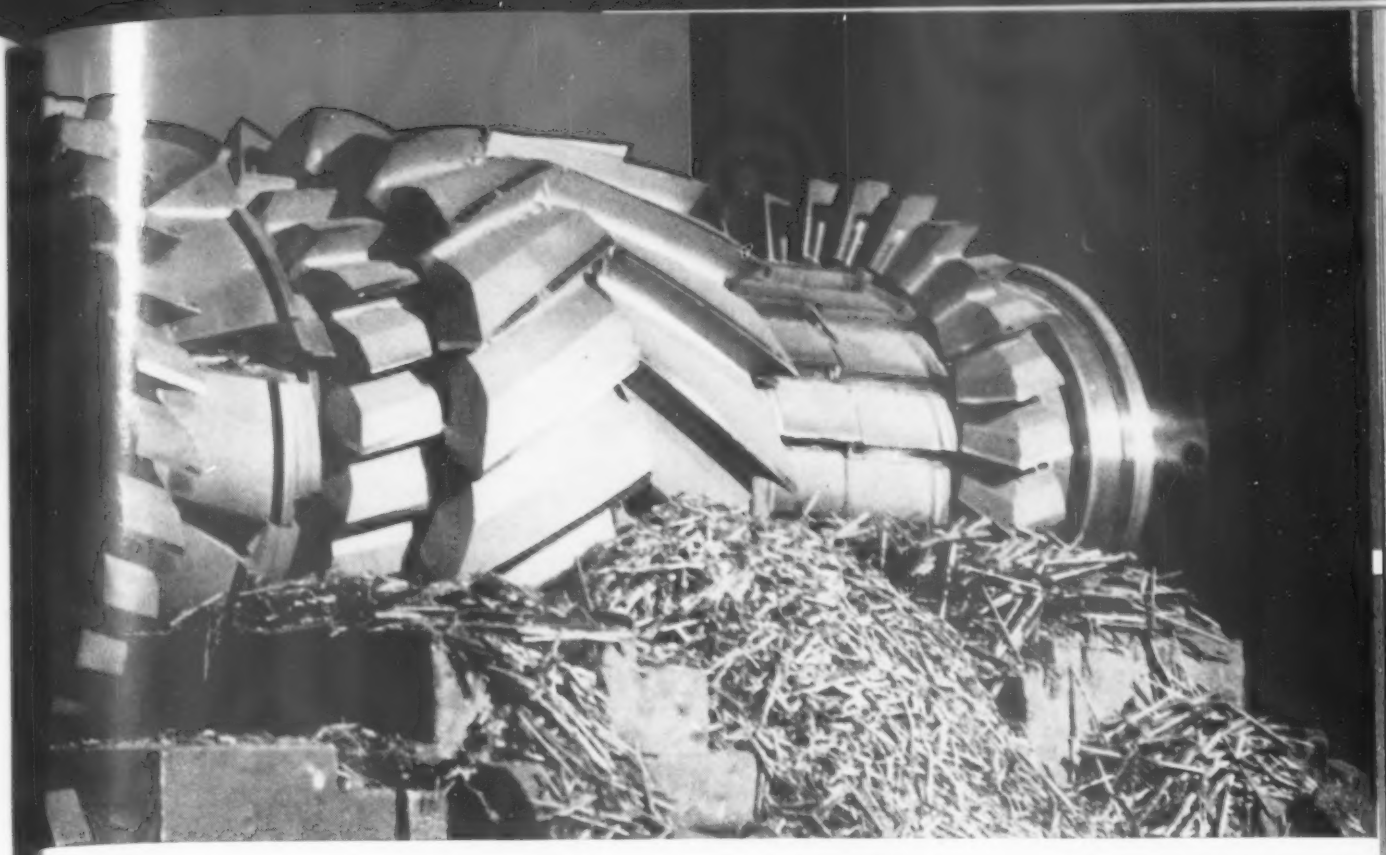
ENGINEERS AND BUILDERS OF PRODUCTION MACHINES



Cutters Give You More Production When You Give Them More Care

Follow These Simple Suggestions · They Will Help You Increase Your Production

HANDLE CUTTERS carefully to prevent damage to the cutting edges.

HAVE THE WORK CLAMPED AND SUPPORTED PROPERLY. Work not held rigidly can cause premature cutter wear or even breakage.

MOUNT CUTTERS as closely as practicable to the spindle.

USE ARBORS OF SUFFICIENT DIAMETERS. Insert arbor shanks carefully in thoroughly cleaned taper holes. Ends of collars should not be bruised. Provide adequate arbor support.

RUN SMALL CUTTERS (such as end mills) at the same surface speed as that used for larger cutters.

KEEP CUTTERS SHARP. When cutters are used after they have become dull excessive metal is lost in sharpening. On a production job, sharpen cutters after a predetermined number of cuts regardless of wear.

IN SHARPENING, control cutter clearance carefully and remember softer metals may require several times the clearance of cutters for iron and steel.

COUNTERACT CHATTER. Incorrect clearance and lack of rigidity of machine or cutter drive contribute to chatter which can cause abnormal cutter wear.

BE SURE MACHINE IS HEAVY ENOUGH to stand the cut and use the correct spindle speeds with each setup. Supply ample coolant where it is required.

Give cutters extra care these days when the supply available is limited so that the production requirements for our armed forces can be maintained.

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.
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BORING BARS
ADAPTERS FOR END MILLS
ARBORS FOR SHELL END MILLS
COLLET CHUCK ADAPTERS
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descriptive Victory
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for your copy.

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